



FRIDAY, JULY 6.

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Contributions.

Uniformity of Signals.

NEW HAVEN, June 18, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It seems to me worth while to notice an expression on page 390 of the *Gazette* of June 15. When it is said there that "It is very desirable that there should be uniformity in the style and indications of all the signals on the line of a railroad," the idea readily commends itself to those who enjoy a faith in the economical results of system.

Progress in signaling is not yet so far advanced that any one can fairly assume to know it thoroughly, and every step in the examination of the questions relating to it brings forward new and often unexpected features. Such a study is very closely approaching the importance of a specialty, and while it may be fairly included as a branch of engineering, the engineer who has it in hand needs the most intimate acquaintance with the details of the operating service, and such experience as is seldom the lot of assistants other than those engaged as engineers of maintenance of way, for which the better conditions exist on lines as well organized as the Pennsylvania Railroad.

The sentence above quoted would at first glance seem almost axiomatic, but let it be noticed that two entirely distinct conditions may exist.

First, signals which include all the interlocking appliances and are always controlled by an operator. Such appliances govern complicated yards, gauntlet runs, crossings of distinct railroad systems, or any conditions of conflicting routes, and also blocking systems on lines of crowded traffic or rapid transit. No misapprehension of the controlling nature of the semaphore signals used in such an apparatus should be allowed to exist for one moment in the mind of any employee. A stop signal (semaphore horizontal) ought then to mean stop just as near as may be convenient to the fouling line, but not one inch past it until the signal is pulled clear. If accident renders it impossible to clear the signal the operator should effectually close all conflicting routes and conduct the train past the signal. Such cases need not occur with good signaling once in 10,000 times.

Second, with automatic signaling the conditions are changed, and because of such differences the signals used in automatic blocking need to be distinctly marked for observation. A disk signal or a semaphore signal which is so shaped that it may be readily distinguished from either the home or distant signals of the first—interlocking—system should be provided.

As shown by the report of signals of the Fitchburg and Boston & Albany railroads, the automatic signaling, although successful in providing a most economical substitute for the more expensive block or special signal appliances, which require individual operators at each point, yet will, with the best of care, occasionally be found out of order. When this happens, a train might approach a signal and suffer an unreasonable delay, because the signal would not come clear to let it pass. Hence it will always be found necessary to provide some special rule by which the business of the road may be continued. Such a rule usually permits the train to proceed with caution, or only as the way is seen to be clear after making a stop for the signal. But such a rule as that must never apply where an interlocking apparatus is provided, and if the engineer is to be guided without the aid of distinction in the signals, between which are automatic, and which are controlled by an operator, then the additional hardship is imposed upon him of requiring him to learn the details of the apparatus at every location; and for lines where it is often necessary to transfer engineers temporarily from a run on one division to the connecting division, much more care must be exercised in detailing the men, and much inconvenience may be unnecessarily developed.

Settlement for Through Billing.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The results of the general convention of accounting officers called to consider the question of agreeing upon some uniform method of settling joint accounts of freight billed through, which was held at the Grand Pacific Hotel, Chicago, Dec. 7, 1887, were duly published at that time, and whilst this may be considered a rather late date to criticize

those results, it is, nevertheless, the object of this paper to do so.

The character of the resolutions adopted by the convention was certainly a matter of amazement to many thinking railroad accountants, particularly when it is noted that representatives of 76 railroads were present. That representatives of this large number of roads should, in the year 1887, declare in favor of the ancient and clumsy method of settling such accounts by monthly abstracts rendered by the forwarding roads, is certainly a circumstance no less remarkable than to be regretted.

Every railroad accountant who has a thorough knowledge of the system of settlements at junction points, of freight billed through, and who, at the same time, is compelled by some particular road to settle joint billing with that road on monthly forwarded abstracts, will readily admit that the latter method is decidedly clumsy, besides being very unsatisfactory in various particulars, as will be explained further on.

The manner of handling these abstracts is generally as follows:

When the abstracts reach the auditor of the receiving road he holds them until all the way-bills stated thereon are received by his agents, or until he ascertains, by correspondence, that some of the way-bills will never be received because of wrecks before the freight had reached his road, diversion of freight en route, etc. When his knowledge touching all the way-bills is complete, he corrects the abstracts, where necessary, on account of errors in billing and abstracting, and returns them to the auditor of the road that forwarded them. The latter examines the corrections made, and if he finds that he can accept them all (which, from his standpoint, is not likely) he returns them with his acceptance. If he finds, as he supposes, or as may be true, that some of the corrections are improper, he returns the abstract with his objections noted, where necessary; and it not infrequently occurs that the abstracts are thus interchanged between the two auditors two or three times before an agreement of figures is finally reached.

In the meantime the receiving road, according to the resolutions of the convention, is compelled to settle with the forwarding and intermediate roads by the 25th of each month, on the original figures stated on the abstracts of the billing for the previous month. Such settlements will necessarily include much billing for freight which, when traffic is heavy and the distance traversed is great, cannot possibly reach the receiving road until weeks after the date of settlement; and they will also include billing for freight which, on account of wrecks and diversions, will never reach the receiving road. In short, the "Abstract" system compels the receiving road to settle for billing for which it has not received the freight, which is unfair. It is true that the system works both ways; that is to say, the road in the east which forwards abstracts has the advantage of having them settled on the same basis as that upon which it is compelled to settle on the abstracts which it receives, but when the difference between east and west-bound traffic is considered, the system is particularly unfair to the roads in the east. It is a decided hardship to the poverty-stricken roads (to which one of the speakers at the convention referred) to compel them to pay charges on freight before the latter is delivered to them.

The system of settlements at junction points does not present any such unfairness or hardship, for such settlements represent, at the periods they are made, the billing for freight which has been actually interchanged only. And, as junction settlements must still be made for such freight as is necessarily rebilled, the machinery for doing the work is already on hand, and the additional clerical force, at low salaries, required to handle the joint billing, is offset by the reduced clerical force, at higher salaries, required in the auditor's offices.

One of the speakers at the convention said that "through billing is constantly increasing, and that the practice must be continued whether accountants like it or not, as the traffic men are always able to show that business will be lost if local billing and settlements at junction points are continued," which is no doubt all true except as to "settlements at junction points." Traffic men are generally utterly indifferent as to the manner of settlements and systems of accounts, so long as the same do not interfere with the prompt movement of the traffic, and it is a well-known fact that the junction settlements of through way-bills do not have that effect, as the way-bills, being carried on passenger trains, almost invariably reach the junction points in advance of the freight.

While, therefore, as between the two systems of settlements, the one at the junction points is to be preferred, it is not, however, what may be considered the ideal system.

What the railroads of this country need is undoubtedly a clearing house for the settlement of all joint traffic. This proposition is probably too radical to begin with. Let it, therefore, be modified by suggesting a number of clearing houses, or bureaus, as, for instance, a "New York Central Line Bureau," for the settlement of all joint traffic which the New York Central & Hudson River interchanges with its connections; an "Erie Line Bureau," for the settlement of all joint traffic which the N. Y., L. E. & W. interchanges with its connections, and so on. The effect of the workings of a few such "Bureaus" would eventually result in the consolidation of them all into one grand clearing-house which would settle the joint traffic of all the railroads east of the Rocky Mountains; which would furnish each road with the statistics it would require for the stockholders, states and the general government; which would see that rates are rigidly maintained by all concerned; which would have the power of preventing any road from getting the better of its rivals by improper billing; which would be

in a position to certify to [the Inter-state Commerce, or any other Commission, that the law was being fully complied with, and which would be able to do all this at a greatly reduced expense, compared with the present expense to which each road is subjected on this account. ESHAVA.

Home Route Cards and Slips.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In the report of the proceedings of the Car Accountants' Convention, published in the *Railroad Gazette* of June 29, reference is made to the system in force on the West Shore of moving empty foreign cars on running slips or, bills made from the home route card. As this is a question of considerable interest to all roads having a large interchange business, you will perhaps like to show the system more fully for the benefit of your readers. I send you herewith samples of the running slip and home route cards, with copy of the rules governing their use:

West Shore Railroad; General Order No. 6.

- Two home route cards must be attached to all foreign cars, one on each side, when first received from connecting lines. These cards to be removed after they have served their purpose, and before the car is returned to the road from which originally received.
- Agents will provide conductors with "running slips" or cards for all empty foreign cars, which should invariably be made up from the home route cards. In the absence of home route cards ask the car accountant for proper route, and when received fill up home route cards (Form C. R. 101, accordingly, and attach one to each side of the car in question.
- Conductors must not move empty foreign cars from any station without the proper running slip or card, except by special order of the Division Superintendent.
- Foreign cars may be loaded to any point on the West Shore Railroad in the direction of the junction point at which originally received, as per home route card, but not beyond; also to any point on the road from which received; also to any point on or reached via the road owning the car, via any junction point, without respect to the home route card. Agents and Yard Masters must be careful to see that all foreign cars placed for loading bear the proper home route cards.
- Whenever foreign cars can be delivered direct to the road owing them at a junction point nearer than the one at which received, ask the Car Accountant for authority to send home via the nearer junction point.
- Home route cards need not be attached to any cars in the West Shore Line, Hoosac Tunnel Line or Nickel Plate Line. Empty cars in these lines not needed for immediate loading, and belonging to roads other than the West Shore, should be reported promptly to the Division Superintendent for disposition, giving initials of the road owning the car.

[The forms below are condensed in size; see note at the top of each. Form 101 is on a red card.]

(Form C. R. 77, card 13 1/2 x 3 in.)
WEST SHORE R. R.
Return to D. & H. C. CO.
Via SOUTH SCHENECTADY.

(Form C. R. 77, same as above.)
WEST SHORE R. R.
Return to D. & H. C. Co.
Via ALBANY.

(Form C. R. 101, card 2 3/4 x 2 3/4.)
WEST SHORE RAILROAD.
SEND THIS CAR

To.....STATION
BY ORDER OF.....
FROM.....STATION.....188..

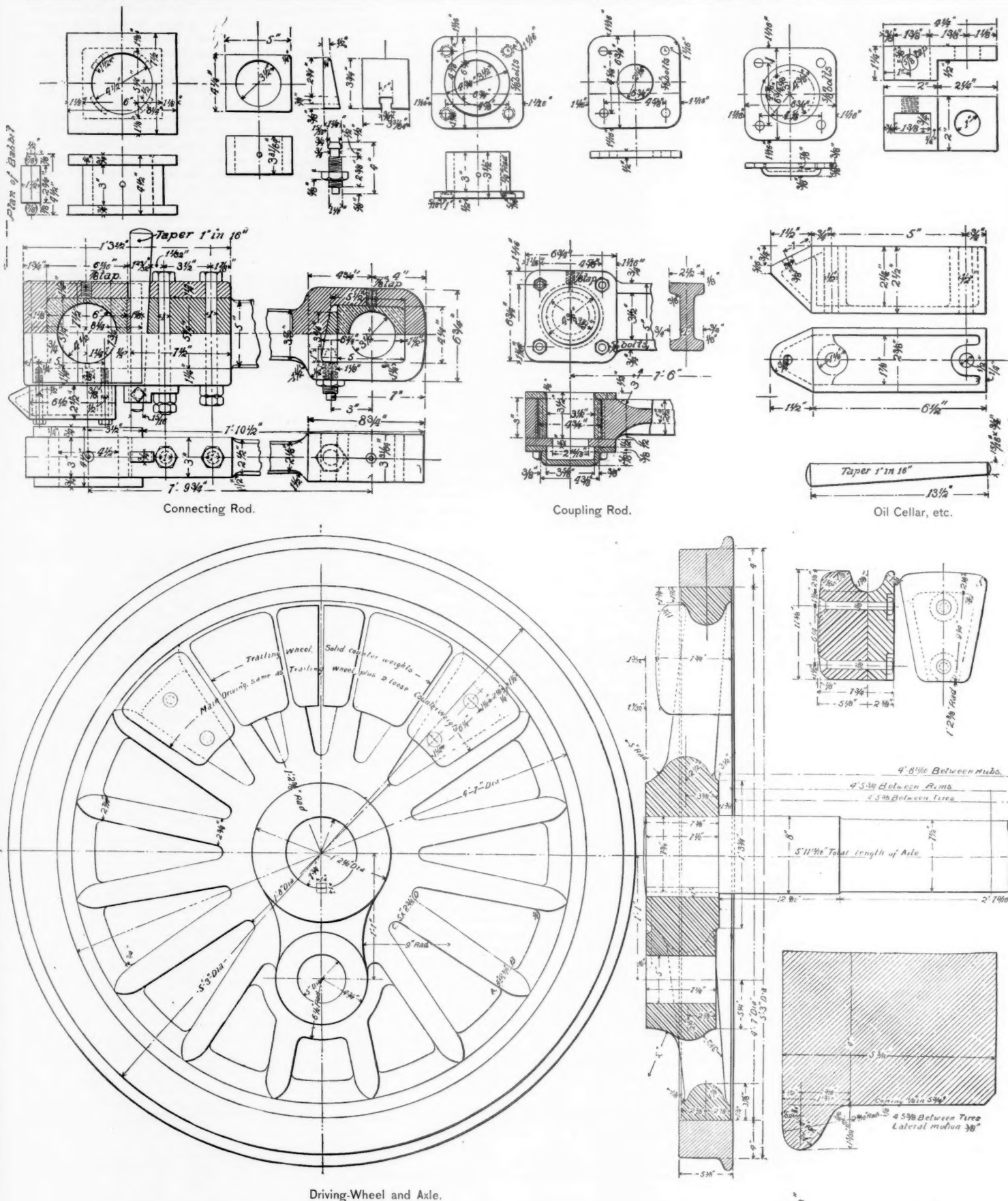
(Form F. R. 187, card 3 1/2 x 9)
WEST SHORE RAILROAD.
RUNNING SLIP FOR EMPTY CAR.

Initial.....Car No.....
From.....
Date.....
To.....
FOR.....

Make this Running Slip from the HOME ROUTE CARD on the car, and show the road to which car is to be delivered in accordance therewith. In the absence of Home Route Cards ask the Car Accountant for instructions.

C. W. BRADLEY,
Gen'l Sup't.

Form 77 is printed for all junction points, and cards are attached as soon as the cars are accepted. Form 101 is furnished to all stations, to be attached to any foreign cars that may be found without the regular home route cards on them, as per rule 2, or when it is desired to change the route, as per rule 5. The effect of this system is to keep home route cards on all foreign cars when moved in trains and when placed for loading, thus protecting the West Shore mileage account, and insuring the fair treatment of the cars of other roads. How to keep foreign cars in their proper routes has long been a knotty question, and many different schemes have been proposed and tried, our present plan being the third one we have tried before obtaining satisfactory results. The business of another road using about the same kind of foreign cars as are run on the West Shore is handled by West Shore engines at our New York termini, and similar conditions obtain at several junction stations. Under the simple home route carding system, without the running slip, we found that foreign cars arriving at these stations doing mixed business were frequently forwarded, either empty or loaded, over the wrong road, and there was always great difficulty in locating the responsibility for the error between the agent, yard master and conductor, as the home route card generally turned up missing. By using the running slip for empty foreign cars, and the rule governing the loading of foreign cars according to home route cards, this trouble has been entirely overcome. The duty of keeping foreign cars in their proper routes being



DETAILS OF WOOTTEN EXPRESS LOCOMOTIVE, UNION PACIFIC RAILWAY.

placed entirely with agents or yardmasters, and the running slip being *prima facie* evidence against them of every error made in misrouting, the exercise of sufficient care to keep such mistakes at the minimum is assured. Yard clerks fill up the running slips from the home route cars as they take the numbers of the cars for their car reports, and no increase in force was required at any point on our line. To roads having junction points at which connection is made with several different lines, the showing on the running slip of the road to which the cars are to be delivered is a most important feature, in that the yard master at the junction station knows just how to switch the empties as well as the loads just as soon as the running slips are handed him by the conductor of the incoming train. Otherwise each car must be examined, and any cars on which the home route cars are missing must be stored until the yard record is consulted to see from which of the several connecting lines the car was originally received. Also with this running slip conductors are enabled to bunch all the cars in their trains for respective routes,

and to report to the car distributor so many empty foreign cars for such and such a route, which is a much more intelligible and shorter way than to report the cars under the names of owners.

W. G. WATSON.

Details of Express Wootten Locomotive, Union Pacific Railway.

The accompanying illustrations represent the driving wheels and axles and connecting and coupling rods of the engine illustrated in our issue of June 15, 1888.

The construction of the various parts is shown so clearly that little description is necessary.

The coupling rod brasses are of somewhat unusual design, and are secured to the rod in a more positive manner than is usually considered necessary. While this construction is somewhat more expensive than the usual plain bush forced into the rod, it removes all possibility of the brass turning or shifting so as to block the oil hole.

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The Annual Convention of the American Society of Civil Engineers.

This convention began in Milwaukee, Thursday, June 28. The attendance was not so great as it generally has been in recent years. The party which left New York Tuesday morning in a special train of four cars numbered but 36, and accessions at various points along the route brought the party up to about 60 by the time the train reached Milwaukee. The whole number in attendance reached probably about 125.

The journey from New York was agreeable, the temperature having moderated, and showers having effectually laid the dust. The schedule of the special train required the run to Chicago to be made in 27 hours, and to Milwaukee in 31 hours, by the New York Central & Hudson River, Michigan Central and Chicago, Milwaukee & St. Paul roads. Stops of 50 minutes in Albany and 1½ hours in Chicago were included in this time. The train arrived, however, about an hour late at Milwaukee, having lost 1½ hours in the run to Buffalo, made up over an hour before reaching Chicago, and lost some time in Chicago.

From Detroit to Michigan City the train was hauled by the 10-wheel Schenectady locomotive illustrated and described in the *Railroad Gazette* of Feb. 24, 1888, page 116. This engine has been in service, hauling heavy fast express trains for some six months, and the officers of the road are highly pleased with its performance.

Careful arrangements for the comfort of the comfort of the society had been made by the local committees in Milwaukee. These committees were as follows:

Committee of Arrangement, D. J. Whittemore, C. E. L. B. Davis, G. H. Benzenberg, C. J. Poetsch.

Reception Committee, S. A. Harrison, E. P. Allis, Albert Conro, C. E. L. B. Davis, C. L. Colby, C. A. Carpenter.

Committee on Banquet, D. J. Whittemore, Onward Bates, F. W. Kimball, S. A. Harrison, G. H. Benzenberg, E. P. Allis, Albert Conro, C. L. Colby, H. J. Hilbert, T. Appleton.

Committee on Excursions, F. W. Kimball, R. R. Minturn, C. A. Carpenter, H. J. Hilbert, Onward Bates, C. J. Poetsch.

The meetings of the society were held in the Athenæum, a very comfortable building, owned by a stock company, composed wholly of women. All of the stockholders are also members of the Woman's Club of Milwaukee, an organization which seems to have no aim more definite than to promote the amenities of life. The Athenæum building contains an assembly room, audience hall, parlors, kitchen, etc., and the society was probably never more conveniently accommodated at a convention.

The first session of the Convention was on Thursday morning. Mr. George H. Benzenberg, City Engineer of Milwaukee, was chosen chairman of the Convention.

The first paper was "Some Facts in Relation to Friction, Waste and Loss of Water in Mains," by Mr. Charles B. Brush. The paper was an admirable one in style and method. It was a brief account of some of the experiences of the Hackensack Water Co., Reorganized, which supplies the city of Hoboken. The paper had especial interest in the showing of the effect of the use of meters in preventing waste. There was brief discussion.

Mr. E. E. Russell Tratman read a paper on "English Railroad Track," giving details, with quite elaborate drawings, of standard English rail sections, chairs and fastenings. The facts presented are probably pretty well known to American engineers concerned with railroads.

During the afternoon session of the Convention the Woman's Club gave a reception in the assembly room of the Athenæum to the ladies of the party.

The evening session of Thursday began with the customary exchanges of formal civilities. The Society was welcomed to Milwaukee by Mr. C. L. Colby on behalf of the resident members, and Mr. Joseph M. Wilson replied for the Society. An address of welcome on the part of the city was made by the City Attorney, Mr. Elliott, in the unavoidable absence of the Mayor. To this Vice-President Croes replied.

The President of the society did not attend the convention because of the terrible affliction which has lately befallen him, the particulars of which are well known. His annual address was read by the Secretary. It was devoted to the Canadian Pacific, and as will be seen from the abstract given elsewhere, it was a comprehensive and wonderfully interesting sketch of the history, finances and physics of that road.

After the reading of the address the following resolution was adopted by a rising vote:

Resolved, That in view of the sad affliction that has prevented the presence of our much respected President at this convention, we tender him our most sincere sympathy and condolence in his time of bereavement.

The session of Friday morning opened with the reading, by Col. J. T. Dodge, of a memorandum on "The Destruction of Rails by Excessive Weights."

Speaking of the evidences of flow of the metal of the rail head, as shown by sections of worn rails, Col. Dodge said:

"On the rail of a fast-speed tangent no lip is perceptible on either rail, but on like rails for slow speed the lip is clearly visible. On the rails of a fast speed curve there is a heavy lip on the outside of the inner rail and only a very slight one on the outside of the outer rail. On a slow speed curve the lip upon the outer rail is more marked and on the inner rail a little less so. These facts harmonize with what is to be seen in almost any railroad yard, the speed being slow and the destruction of the rails by the flow of metal enormous.

"It has been argued that because in a certain experiment where a pressure of 53,760 pounds per square inch was applied to a piece of soft iron by a steel die one-half inch square before producing a perceptible indentation, therefore

an engine or car-wheel on a steel rail cannot produce any distortion of fibre. Now the argument is good in its place, but it cannot controvert the facts before our eyes. That the metal of rails flows under the weight of the wheels is a fact of observation. That those weights are excessive is a conclusion of reason. No form of rail can be devised which will insure any definite area of bearing for each wheel. These bearing areas will vary as the radii of the wheels. They should also vary, as the width of the rail heads, and will vary according to the condition of the tire, some being flat and some concave by wear. Car-wheels are usually coned, drivers are not; hence by no probability will all the wheels of a train have the same contact with any one rail.

"The conclusions deducible appear to be as follows: Diameters of wheels should be as large as practicable; rail heads should be as wide as practicable; tires should be kept as flat and perfect as practicable.

"As to the diameters of the wheel, the area of contact of wheel with rail being directly as the diameters, the weights to be carried should decrease in like manner. Hence, an eight-wheel freight car weighing 25,000 lbs., when loaded with 41,000 lbs. additional, will be fully as destructive to the rails as a consolidation locomotive carrying 96,000 lbs. on its eight drivers of 4 ft. diameter.

"In view of the fact just stated, the tendency to increase the weight of the rolling stock seems to me to have passed its proper limits and that we should call a halt."

There was some discussion on this subject. One or two speakers agreed with Col. Dodge that limit of loads has been reached, but more of them argued that loads will probably increase and that the sustaining capacity of rails and structures must be adjusted to them. While it was suggested that the weight of rails should be increased, there was no suggestion of improvement in section or material to arrest the destruction of the surface by the loads now concentrated on the wheels of heavy rolling stock.

Friday afternoon a business meeting was held.

The report of the Committee on Uniform Standard Time was received and referred to a special committee consisting of Mr. Frederick Brooks and Mr. Percival Roberts, Jr., to report at some future time.

The report of the Committee on Compressive Strength of Cements and the Compression of Mortars and Settlement of Masonry was accepted and ordered printed, and the Committee continued.

The Committee to consider the proper Relations to each other of the Sections of Railroad Wheels and Rails reported progress, through the Secretary. The Secretary stated that the Committee had gathered a great amount of data and done much work, but had formulated no conclusions.

The report of the Committee on Grades and Titles of Engineers on Public Works was referred back to the Committee.

The following committee to nominate officers for the coming year was elected: For the states north of the Ohio River and the Northwest, Maj. A. B. Rogers, of St. Paul. For the Southern states, Kansas, Colorado, the Southwest and the Pacific Coast, Mr. William B. Knight, of Kansas City. For Pennsylvania and the South Atlantic states, Mr. Alexander Dempster, of Pittsburgh. For New England, Canada and that part of New York not included in the group with the resident members, Mr. E. P. Sterns, of Boston. For New York City and 50 miles around, Mr. William G. Hamilton, of New York.

The following resolution was adopted: That all reports of special and standing committees be forwarded to the Secretary 60 days before the annual convention, and that printed proofs of such reports be distributed to members 20 days before the meeting of the convention.

The business meeting then adjourned, and the sessions of the Convention were resumed.

A brief paper was read by Mr. G. W. Pearsons, of Kansas City, on the Siphons of the Kansas City Water-Works. There was some discussion, chiefly as to the effects on the proper aeration of the water resulting from pumping a vacuum.

A paper on Improvements of Rivers on the Atlantic Coast, by Col. W. P. Craigbill, Corps of Engineers, U. S. A., was read by Mr. Burgwyn, of Richmond, Va. There was no discussion.

Friday evening everybody went to a reception given by the local members to the members and guests of the Society.

The session of Saturday morning opened with the reading of a paper by Mr. Clemens Herschel on the "Venturi Water Meter." This was written as a discussion on a paper on the same subject already published in the Transactions.

This was followed by a paper by Mr. J. B. Francis on "High Walls or Dams to Resist the Pressure of Water," which was very briefly discussed.

Four papers on "The Manufacture of Brick," proofs of which had been distributed, were read by title only, as introducing the subject for discussion. Mr. Farrington, of Chicago, the author of one of the papers, had been asked to be present to take part in the discussion, and in answer to questions by various members he said that he did not consider brick making, as practiced by the Romans, a lost art, but that, on the contrary, many of the brick made to-day would probably endure as long as the Roman brick. This he considered dependent mostly on careful selection of the clay, and in this, as in other branches of the art, he looked for great advances in the next 20 years. The tensile strength of machine made brick he thought depended very much on whether or not they are cut across or parallel with the fibre as they leave the machine. He had never seen brick that could not be ruptured by the slacking of particles of lime in the interior when water was absorbed, but this he did not think a common occurrence. He considers that brick

should not be used in foundations or elsewhere when the results of absorption are likely to be serious, unless it had been burned to vitrification.

Mr. Farrington, Mr. Francis and Mr. Benzenberg spoke of the economy and advantages of using brick burned to vitrification not only in sewers but in large masses of masonry, where some irregularity of form consequent on the extreme burning would not be objectionable.

Prof. J. B. Johnson spoke of tests for strength of brick which he had made, showing the great difference in results obtained with brick tested in different positions. Tested flatwise they gave much higher ultimate strength than when tested in other positions, and he thought the Watertown tests misleading in this particular, and protested against the continued practice of reporting such tests without qualification.

Mr. Allan D. Conover, of Madison, Wisconsin, gave an account of certain bricks made in that locality which have the valuable quality of increasing in strength and hardness by exposure, but discolor badly when wetted.

Papers by Mr. C. L. Strobel, on Z-iron Columns and Mr. J. G. Dagron on Steel Compression Members were read by title.

After half an hour spent in listening to a discourse by the Librarian of the City of Volapük, the morning session adjourned.

Saturday afternoon was spent in visits to the works of E. P. Allis & Co., the shops of the Chicago, Milwaukee & St. Paul, and the works of the Milwaukee Cement Co. At the railroad shops the visitors saw the operation of casting wheels in Barr's contracting chill. The foundry has a capacity of 200 wheels a day, and all of the non-contracting chills have been discarded, or will be shortly. Cast iron culvert pipe made at the company's foundry was also seen here.

In the car shops were cars fitting up with the steam heating system which the company has adopted. By this system the train pipe is carried overhead through the cars and the couplings are, of course, overhead. Ventilation is provided for by taking air in by the Spear hood, and passing it through a box provided with a steam coil. The car is also piped for direct radiation.

The week ended brilliantly with a complimentary performance of the "Bohemian Girl," at the Schlitz Park Opera-house, to which the members of the Society and their guests were conveyed in a formidable procession of street-cars. The music was fine, the performance good, and the beer needs no praise. To most of the Eastern visitors this delightful resort, where any summer evening one may hear first-rate music, see a fair play, and stroll about in a pretty park, all for a very moderate charge, was a revelation of the civilizing influence of the German.

The closing session of the convention was held Monday morning, July 2. The first paper was by Mr. Williams on the Panama Canal. The Secretary read extracts describing in detail the dredging plant.

Mr. James R. Wardlaw read a short but excellent account of the moving of the Brighton Beach Hotel.

Mr. Wagner's paper, already published, on the Maintenance of Railroad Structures, was discussed in a short paper by Mr. Seamen, who spoke chiefly of the duties of shop inspectors.

Mr. D. J. Whittemore made some remarks on Mr. Strobel's paper on Z-iron columns. He said the column had an economic value from its form, and the further advantage that it is not controlled by any combination of makers. He objected to the name, however, as the form will be used in steel as well as iron, and suggested that it should be called the Strobel column.

Mr. Tratman read a short discussion of a paper by Mr. Post, Engineer of the Netherlands State Railroads, on the Use of Metallic Cross-ties. Mr. Tratman urged the use of metal ties for first-class roads.

The convention passed resolutions thanking various individuals and bodies for the courtesies and services which made the convention so pleasant and successful.

Past-President D. J. Whittemore, particularly, was recognized as having done more for the convention than any other or all the other local members, and all present joined in giving him three rousing cheers. Mr. Whittemore was touched by the very evident heartiness with which his name was received, and could respond in but a few words. He spoke of the thirty-five years that he had lived in Milwaukee, first almost alone, as an engineer, and now as one of a large group, many of whom are distinguished. For years he had hoped to help entertain in Milwaukee the Society which had greatly honored him, and this convention was one of the happiest events of his life.

With this session the formal proceedings of the convention ended. The usual banquet was held Monday evening, and Monday afternoon, Tuesday and Wednesday were given up to drives and excursions.

It remains only to add that the weather was perfect, the people of Milwaukee very hospitable and the arrangements of the local committees very complete.

Naturally the "exhibit" at this convention was not large. Engineers are not supposed to buy things, and the lobby does not make much of a figure in their assemblies. Three rail-joints were shown, the Gray strengthened angle splice, used on 3,000 miles of track on the C. & M. & St. P., the "continuous" of McConway & Farley, and the "trussed elastic" of Col. Long, of Chicago. Mr. H. W. Hubbard, of Milwaukee, showed a lot of triangles, T squares and curves made of celluloid. They were not only beautifully finished and highly elastic but transparent, a quality which a draughtsman will often appreciate.

New St. Pancras Freight Station, London.

American visitors to London will have noticed a high ornamental wall with elaborate wrought gates adjoining the St. Pancras station and hotel, one of the three or four hostleries specially devoted to Transatlantic visitors. Few, however, will have suspected that this ornamental wall encloses one of the largest and most elaborate freight stations in London. The main line of the Midland Railway being here about 20

generally 9 ft., of the usual style of English four-wheeled freight car or "wagon."

The following description is taken from the *London Engineer* of April 6, 1888.*

The new St. Pancras goods station, which has just been opened for traffic, is situated in the Euston road, immediately westward of the passenger station and Grand Hotel, covers an area of about 14 acres, and is constructed in two floors or yards, the upper one being at the level of the rails of the main line, while the other is level with the streets. The

of the lower level is paved with granite; every part of it can, therefore, be traversed by carts. It is lighted in the daytime by means of openings left in the iron flooring above, and at night by 1,880 gas lights. This low-level yard is used entirely for what is known as "station to station" traffic; that is, traffic which the railway company has not to cart or deliver.

The potato and vegetable stores, which face the Euston road and Midland road, form a prominent feature of the station; they are situated on a private road 40 ft. wide, which runs parallel with the streets. These 23 stores are let to different merchants; each store is practically a small private railway station, including offices, with cellars beneath, 27 ft. by 24 ft., and a siding and platform some 100 ft. long. The stores and platforms, as well as the private roads, are covered by a glass roof about 30 ft. above the ground. The quantity of potatoes annually brought into London amounts to 400,000 tons, and the Midland has already secured a fair share of this traffic, new St. Pancras being considerably nearer to the chief vegetable market, Covent Garden, than any other railway depot of the kind.

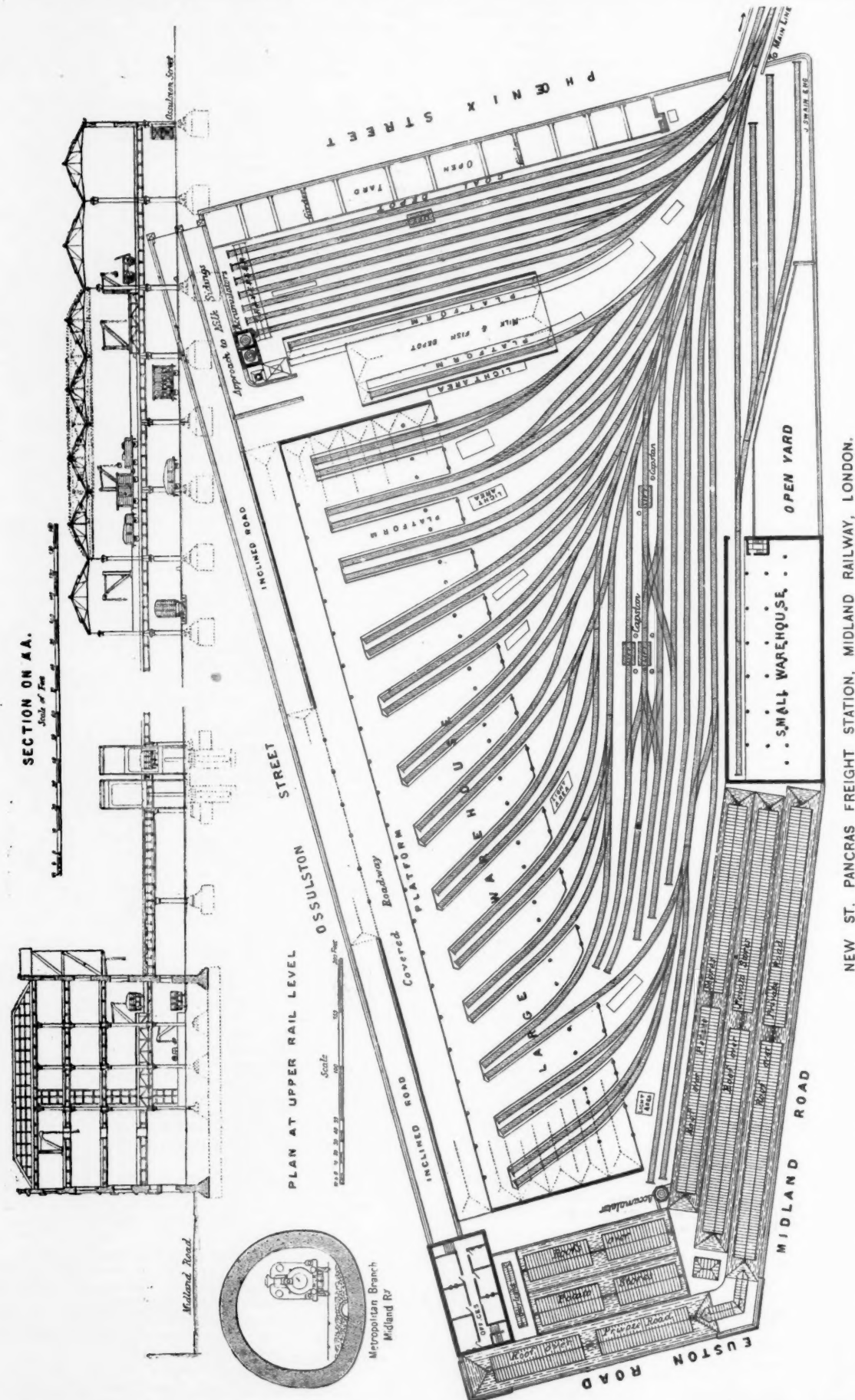
On the east side of the yard and facing Midland road is the small, four-story warehouse, 230 ft. long by 100 ft. wide, and over 80 ft. high. Over 1,000 tons of wrought iron were used to form the floors. A siding runs into this warehouse on the ground floor, and another on the first floor, hydraulic cranes and hoists and other modern appliances being now in course of erection. At the extreme north end of the station a large space is set apart for coal traffic, the cars arriving from the main line being taken down the hoists to the lower level and there unloaded by hand, thus avoiding the breakage which always occurs where chutes are used.

The high-level station, shown on the accompanying plan, is intended for the ordinary traffic. The large warehouse, or freight shed, which faces east and west, is about 740 ft. long by 150 ft. wide; twenty-six sidings run into it obliquely, a very exceptional arrangement, rendered necessary by the shape of the property occupied. Between each pair of sidings is a platform about 27 ft. wide, for dealing with the freight. This warehouse, which is not yet completed, is approached from the streets by two easy inclined roads, one from the Euston road, and the other from Phoenix street, ample covered space being left at the back of the shed for vans and carts. This freight shed is set out with a view to the rapid dispatch of loaded trains, turn-tables being avoided. Thus the thirty wagons forming an express freight train to Leeds, for instance, might be set in three consecutive sidings in the shed, which are arranged to hold ten wagons each, when these wagons are loaded the train engine has simply to draw them out, back on the caboose, and go straight off to the north. Very few London freight stations are worked without the use of turn-tables, although the expense and delay which are inevitably caused by this system are well known. The necessity for turn-tables at St. Pancras is avoided by laying the sidings in the large freight shed at an angle of about 60 deg. with the shed, instead of on the square as is usually done.

A large covered depot is provided on the upper level for the milk and fish traffic. It consists of two sidings with long narrow platforms and a 40 ft. roadway between for carts, etc., the whole being covered with a light iron roof in three spans, while the sides of this depot are formed of timber paneling between the wrought-iron roof columns. At this station some thousands of churns, each containing thirty-six gallons of milk, are dealt with daily, and the trade is continually increasing.

A double track railway, carried by a viaduct over Phoenix street and St. Pancras road, connects the upper yard with the main line of the Midland Railway. The west side of the higher level is laid out with many long sidings for the cars going to or from the lower yard. Three 20-ton hydraulic hoists are provided in this part of the station for taking the cars from one level to the other. It was originally intended to work the lower yard as well as the rest of the station by locomotives, but they were found to foul the air to such an extent that the idea was abandoned, and all the shunting on the low level is now carried on by some fifty hydraulic capstans with ease and dispatch although the length of sidings worked is over three miles. The engines and accumulators for working the hydraulic machinery are placed on the low level at the extreme northwest corner of the yard. The boilers are multitubular, of the locomotive type. The pumping engines are direct-acting of the ordinary pattern, with cylinders 16 in. diameter and 22 in. stroke, the diameter of the plungers being 5½ in. Three boilers and three pairs of engines have been laid down to start with, but room has been provided for double this number. The engines and boilers were made at the locomotive works, Derby; the contract for the hoists, accumulators, capstans, and the rest of the machinery, was let to Messrs. Tannet and Walker, of Leeds. The whole of the machinery was

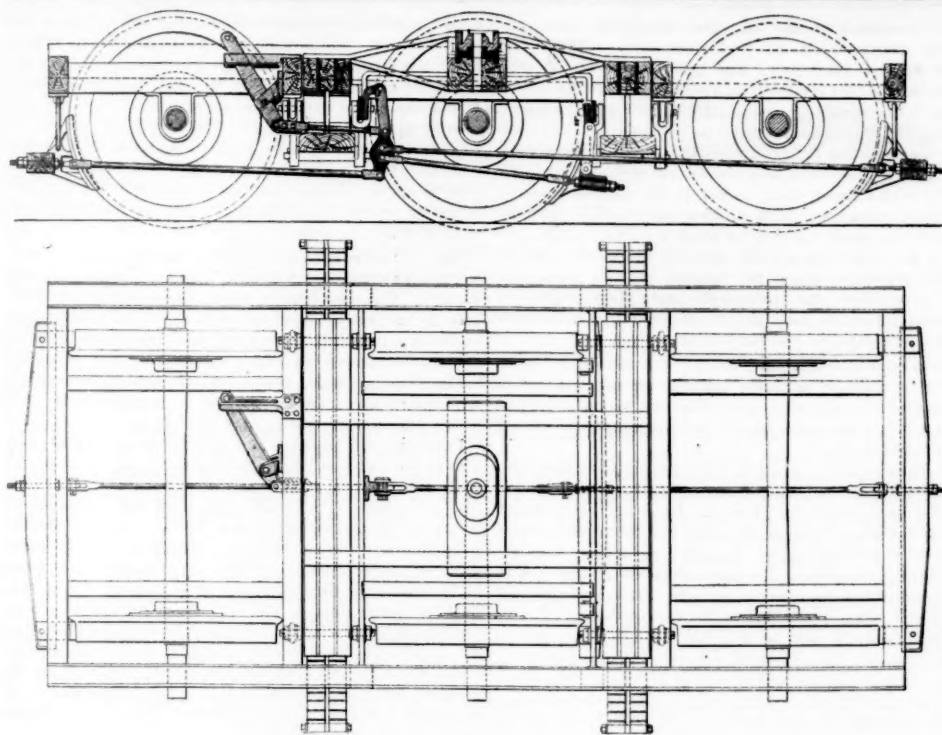
made from the designs of Mr. S. W. Johnson, the locomotive superintendent. The accumulator rams are 18 in. diameter and 20 ft. stroke, and are loaded to give a pressure of 750 lbs. per square inch on the water. Two such accumulators are fixed in the tower adjoining the engine house, and a third, or auxiliary accumulator, is erected at the far end of the station. The capstans on the lower level are worked by two double-cylinder rams, 3½ in. diameter and 7 in. stroke. The rams are placed one above the other and work on to the vertical cranked shaft; each capstan can exert a direct pull of one ton on the rope.



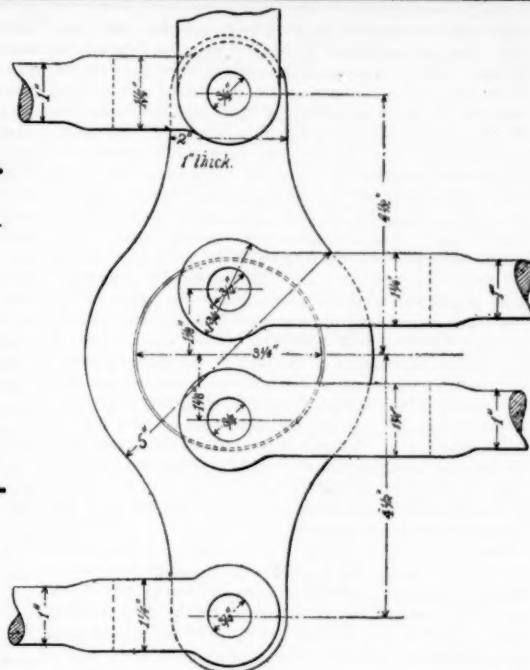
ft. above the street level, a whole block of irregular shape has been devoted to a freight station on two floors, the cars being lowered to the street level by hydraulic hoists. The accompanying illustrations, for which we are indebted to the *London Engineer*, show very clearly the arrangement of the sidings on the main line level, some 20 ft. above the street. The lower floor is somewhat differently laid out, the platforms being chiefly approached by small turntables 12 ft. diameter, which are of course possible with the short wheel base,

lower yard is entered on the western side from Ossulston street by a line of gates 300 ft. wide, or on the eastern side from the Midland road; while the extreme north end of the yard, which is devoted to coal traffic, is approached by several entrances from Phoenix street. The yard is laid with several miles of sidings, a space of from 40 ft. to 50 ft. being left between each siding, so that carts and vans can go alongside any of the cars to load or unload. The whole

*Gross tons of 2,240 lbs are used throughout the following description. Further particulars of this station will be found in the *Engineer*, Vol. LX., page 489.



EAMES BRAKE RIGGING FOR SIX-WHEELED TRUCKS.



The 20-ton wagon hoists, of which there are four, are each worked by three rams, for which a pit is provided under the centre of the hoist, the centre ram being 9½ in. diameter and the others 5 in. diameter. One of the small rams is always open to the pressure so as to balance the dead weight of the hoist, and the valves are so arranged that in lowering a heavy weight the water from the big ram can be returned into the accumulators, and when raising a light load—an empty car, for instance—the small ram only is used, the large ram as it ascends drawing water from a tank fixed above the guides of the hoists. The cranes are of the pattern usual at modern goods stations, the rams being fixed in the upright part of the framing; they are of powers varying from 1 to 5 tons.

The whole of the station is inclosed by ornamental brick walls about 30 ft. high of Gothic design, to match the work of Sir G. Gilbert Scott in the neighboring Grand Hotel. These walls are faced with red Leicestershire bricks and white Mansfield stone dressings, the openings being filled with handsome wrought-iron grilles containing much hammered scroll work.

This upper floor is supported by 410 cast-iron pillars, 2 ft. diameter, the bases of which stand on a kind of pyramid of brickwork 7 ft. square at the top, and below this is a bed of concrete 12 ft. square. The concrete is formed of five parts of screened ballast, three parts river sand, and one part of Portland cement. The whole of the bricks, with the exception of those in the red facing, are brindled bricks from the Staffordshire fields. They were specially made of a size smaller than usual, and are laid so as to size only 11 in. in four courses. Over sixteen millions of these bricks have been used. The mortar throughout was made from Thames sand and Portland cement, in the proportion of three of the former to one of the latter, and was ground under heavy rollers. The cement, which was supplied by the Burham Brick & Cement Co., was specified to stand a tensile strain of 320 lbs. per square inch, after being made seven days and during that time kept in water. The price of Portland cement has been so much reduced of late years that there is now very little difference between the cost of mortar made with cement in the proportion of three to one and of mortar made with good hydraulic lime, while the superiority of cement mortar is considerable.

The depth to which the foundations have been taken varies from 12 ft. to 20 ft. below the rails, and the size of the concrete bases is from 11 ft. to 15 ft. square. The foundations are all taken down to the London clay, the additional weight on which in no case exceeds 1½ tons per square foot. At one corner of the station an old led of the river Fleet was met. It was found necessary to sink cast-iron cylinders 9 ft. diameter to a depth of over 40 ft.; the cylinders were filled with concrete and brickwork, and on them the columns were erected. The river Fleet at St. Pancras is now confined to a miserable 10 ft. barrel sewer; but there is little doubt that, down to the seventeenth century, the Fleet was navigable up to if not beyond St. Pancras Church, the neighborhood of which was then a place of fashionable resort, of which the Spa with its Assembly Rooms and Gardens was the centre.

The rows of columns are placed generally about 32 ft. apart, the distance between the columns in each row varying from 35 ft. to 50 ft. The main girders for the most part are made with single webs, with an average depth of 4 ft., but for the longer spans, and where increased loads occur, box girders are used. The cross girders are 30 in. deep, with flanges 16 in. wide, and are placed about 7 ft. centre to centre. The flange plates of the cross girders, where possible, are in one length, to avoid joints, and in many cases these plates are as long as 33 ft. 6 in. and ½ in. thick. The cross girders are stiffened with T-irons 6 in. by 3 in. by ½ in., bent round, and riveted to the flange plates. The flooring is formed of ¾ in. bent plates riveted to the under side of cross girder flanges, and supported by the T-iron stiffeners; the end plate in each bay is a half buckled plate, and is attached to the main girder as well as to the cross girders, thus making a complete dish of each bay. The joints in the flooring are covered on the under side by bent T-irons 5 in. by 2½ in. by ½ in. In each bay of flooring there are ten holes, into which are screwed short pieces of 1½ in. gas tube, to take the drainage; over each hole is a cast-iron perforated grid, to keep the ballast away from the pipe, and allow the water to run off freely, the water being collected below the flooring by half round cast iron gutters, and conveyed to the drains by down spouts fixed on the columns.

The edges of all the plates are planed, and the flange plates and main angle-irons having been fitted together, the rivet holes were drilled out of the solid through all the thicknesses at once. In the construction of the upper floor 16,000 tons of wrought iron have been used, and a corresponding quan-

tity of cast iron. The length of gutters is several miles. The roof over the potatoe stores is carried by principals 40 ft. span, placed 11 ft. apart. They are formed of T-iron rafters, the ties being forged from round bars. The roof of the milk and fish depot is of similar span. The principals, however, are made of T-iron, and flat bars for the ties, thus avoiding all forgings.

The work was let in thirteen contracts. Mr. John Underwood, of Derby, is the chief engineer, the resident engineer being Mr. J. Allen McDonald, who has carried out most of the extensions of the Midland Railway near London for some years past.

Though there are now many English goods stations built in two stories like new St. Pancras, there are none, we believe, so extensive. The price of land in London is so high that the construction, which practically doubles the capacity of a station upon a given area of land occupied, is amply justified. It is almost surprising that at St. Pancras a third floor, in the shape of cellars, was not constructed. Had this been done, sidings might have been conveniently laid into the cellars—see section A A—from the metropolitan branch of the Midland Railway, which is on a suitable level, and passes beneath the Midland road, close to the outer wall.

Brake Rigging for Six-wheeled Truck.

The accompanying illustrations represent a brake rigging for six-wheeled trucks designed by the Eames Brake Co., of Watertown, N. Y.

The principal feature of the rigging is the equalizing disk, shown in detail. It consists of a disk of cast iron, fitting loosely in a suitable hole in the lever. The disk carries two pins to which the brake-beam pull rods are attached. This method of applying a brake to all the wheels of a six-wheeled truck appears to be simple and efficient. Certainly there is great need for an increase in the percentage of braked weight on the principal fast trains, which most need good brake power, but which at the present time are often run with but 60 to 70 per cent. of the total weight braked, owing to the fact that almost all the six-wheeled trucks running are without brake-shoes on the middle pair of wheels.

The Canadian Pacific Railway.*

When British Columbia entered the Canadian Union in 1871, the principal condition of the union was that the Dominion should within 10 years connect the Pacific seaboard with the railroad system of Canada, construction to commence on the Pacific coast in 1873. It was decided that the road should be built and operated by a subsidized private corporation, and a contract was made with Sir Hugh Allan on the basis of a subsidy of \$30,000,000 cash, 50,000,000 acres of land and perpetual exemption of the property from taxation. Sir Hugh did not form his company, the government changed, and in 1874 it was decided to build the road as a public work. In 1875 construction began between Lake Superior and the prairie region. Another change of government was followed by a reversion to the first policy of building the road by a private corporation, and in 1880 a contract was made with the present company.

The concession on the part of the government included a subsidy of \$25,000,000 cash and 25,000,000 acres of land; right of way through public property; free import of all material for construction; the government to complete the sections then under contract, about 700 miles, and hand them over to the company as a free gift; all property of the company and its capital stock to be exempt from taxation of any kind. Besides these concessions there was the celebrated "monopoly clause," lately surrendered, by which it was provided that for a period of 20 years no line should be chartered south of the railroad except to run in a direction southwest or west of southwest. The company agreed to

* An abstract of the Annual Address of the President of the American Society of Civil Engineers, Mr. Thomas C. Keifer, read at the Annual Convention of 1888.

build 2,000 miles of railroad and to operate it 10 years after completion.

A rapid survey of the financial history of the enterprise was given by Mr. Keifer, but is omitted here as being tolerably well known to our readers.

The general location of the Canadian Pacific, from Montreal to the Rocky Mountains, is governed by three great geographical features, Lake Superior, The Lake of the Woods and Lake Winnipeg. It must go north of the first two and south of the third. Passing from the Ottawa Valley into that of Lake Huron the line traverses, for about 100 miles, the water-shed of Hudson Bay near the height of land. Descending to Lake Superior numerous long rock cuts are encountered, separated by shallow valleys, generally with marshy bottoms and little material for roadbed near them or over them except solid rock, boulders and hardpan. Timber being abundant the grade was thrown up, and trestling was freely resorted to, thus reducing the depth of the rock cuts, and also the difficulty from snow, which generally falls to greater depth than on any other portion of the road, with the exception of the Selkirk Mountains. Along the Eastern Shore of Lake Superior are much heavy rock work and numerous tunnels. The rock excavation runs up to hundreds of thousands of yards on some miles. The cost of one mile is said to approach \$700,000. The highest summit between Montreal and Lake Superior is 1,550 ft. above tide water, and between Lake Superior and Red River it is 1,560 ft. The maximum grade in either direction between Montreal and Lake Superior is 1 per cent., and the sharpest curve 6 degrees. Between Lake Superior and the Rocky Mountains the maximum grade going west is, with one exception, 1 per cent. Coming east the maximum is 40 ft. to Winnipeg and 25 ft. thence to Lake Superior. There is one grade going west from Lake Superior which exceeds the established maximum; that is a short grade starting from Medicine Hat, a divisional station, where a pusher is used.

There is an interesting example of rail creeping on a high/ly elastic roadbed on this division, where the line crosses a "muskeg," the Indian name for bog. The roadbed here yields about 6 in. to every passing train. With a consolidation engine hauling 35 cars, the track crept 23 in. in the direction in which the train was moving. The rails creep for about ¼ of a mile east and about ¼ a mile west of a small bridge at the foot of a grade in both directions. They creep with every train, and in warm weather will often run 12 in. under an ordinary train. Cinder ballast keeps the track in fair line and surface, but does not in the least prevent the creeping of the rails. Spikes must be left out each side of the angle plates, otherwise the creeping rail would carry the ties with it. The whole muskeg, when a train is passing, shows a series of short waves 5 to 6 in. deep. The General Superintendent of the Western Division, Mr. Whyte, proposes to use 12-ft. ties, 40-in. angle bars, and cut a slot in alternate sides of the rail at every tie.

During the construction of this part of the road, some rather serious questions rose out of interpretations of the contractor's specifications. Separate prices were made for granite (the country rock), mica schist and trap, and for trap different prices were made for cuttings under 3 ft. and over 3 ft. deep. Separate prices were also stated for hardpan and cemented material, but tenderers generally did not recognize any difference in their bids, no doubt because the specification applied the same test for both. It read: "Hard material, where a good picker cannot keep more than two good shovelers going, shall be termed hardpan, or cemented material, as the case may be." The price for hardpan and cemented material was 80 cts. (more than double the earth price); the good picker and the two good shovelers

could not be expected to be always together, and however numerous the former might be at any time or place, the pickings were good whether the pickers were good or not. As to solid rock classification, the results on one division were surprising. The geology of the route, which consists largely of metamorphic rocks, was "altered" decidedly. Trap under 3 ft. was \$3.40 per yard, while granite was \$2.20, and more trap was returned at this price than could have existed had all the cuttings been floored with it. When trains could get through, the company's chief officers found their ballast trains working in cuts where there was no ledge rock, but in which large amounts, including trap, had been returned. They ordered a remeasurement, which was confirmed by another one made by the court, and on one contract the final estimate was reduced between \$300,000 and \$400,000. Other similar cases on this division were settled on the basis of the remeasurement. The section engineers who measured and classified the work in the first instance were, generally, in accord with the remeasurement, and the sub-contractors were settled with on their classification. After the sub-contractors had been paid off a revised classification was made out for the final estimate, in which the formation was altered, as effectually as by an igneous eruption, granite merging into mica slate, and trap overflowing everywhere.

The Prairie Section.—For various reasons the company decided to abandon the location which had been adopted by the government from the Red River to the Rocky Mountains, and to follow a line nearly due west on the 50th parallel, both to shorten the through distance and to leave no room for a competing trunk line on the south.

In the prairie sections the line has been kept in embankment everywhere possible as a precaution against snow blockades, and for the same reason slopes have been widened and flattened and the spoil deposited well away from the line as a snow screen. At stations, sidings are thrown out so far that cars standing on them cannot cause drifts on the main line. Only twelve miles of snow fencing are used on the prairie section. There was no detention from snow last winter between the Columbia River and Lake Superior exceeding four hours at any one time. For 400 miles west of Winnipeg there is no good gravel in large quantities, and pockets only sufficient to ballast the wettest portion of the road. The top prairie soil is used for surfacing.

The Mountain Section.—In Canada the Rocky Mountains may be said to terminate as a distinct range between the 51st and 52d parallel; thence descending to the Peace River Pass, latitude 56 degrees north, which is only about 2000 feet above sea level. This is the first river which cuts entirely through the Rocky Mountains, and heads west of the range, draining the table lands between the coast range and the Rockies. Between Peace River and the international boundary, ten passes have been explored, all lowering as you go northward, diminishing from 7000 to 2000 feet in altitude. The Yellow Head Pass, with an altitude of 3733 feet, had been selected by the Government in the first instance as the route for the railroad. The timber line, in the Canadian Rockies, is about 7000 feet above the sea, and above the altitude of 6000 feet snow falls to some extent every month of the year. Above this elevation there are large patches of perpetual snow, and true glaciers are found there. The Mountain Section of the Canadian Pacific extends from the eastern slope of the Rockies to the terminus at the city of Vancouver, 522 miles by railroad, but less than 400 as the crow flies.

The Bow River Valley led up by an easy route from the 50th parallel to more than one pass. In descending the western slope of the Rockies, by the Kicking Horse Pass, the most southern available one, the line leaves the valley of Bow River by ascending one of its tributaries about three miles, to a marshy summit 5,300 ft. above tidewater, and the pass is without cutting or tunnel. Eastward from the point where this line leaves Bow River there is no grade to Atlantic tidewater exceeding 1 per cent., but immediately after crossing the summit the heaviest grade on the whole line is encountered—4½ per cent. on two stretches of 3½ miles each. All the gradients on the Canadian Pacific which exceed 1 per cent. are concentrated upon the 134 miles which lie between Bow River and the point 1½ miles west of Albert Cañon on the western slope of the Selkirk Range.

No trail had yet been discovered over the Selkirk Range, but the distance across this range in the direction aimed at was less than one-third of the distance following the river northward around it by the fifty-second parallel, and therefore strenuous efforts were made to find a pass, which, after repeated trials, was effected by Major Rogers, M. Am. Soc. C. E. This Selkirk crossing, the summit of which is 4,300 ft. above tide water, penetrating a previously unexplored region, is one of the few cases in which the locomotive preceded the Indian in the formation of any kind of trail. The mountain work is not heavy, but its cost is in structures over and under the track, which are called for for protection against snow. Strong and costly sheds are required to meet the avalanches and large bridges merely to get out of the way of them.

During the winter of 1885-86 engineers were left in the Selkirks to study the requirements as to snow-sheds, and in the following summer 35 sheds were built, having a total length of 4 miles. The experience of the next winter caused the further increase of these snow-sheds to 6 miles, and a still further increase of about a mile is found to be necessary.

These sheds are designed according to the service they are to perform: (1) for protection against snow falls only; (2) for protection against avalanches from one side; (3) for protection against avalanches from both sides. The latter are called valley sheds, are flat-roofed and cost about \$60 per lineal foot. The typical avalanche sheds are built

with rock-filled cribs on the mountain side and braced frame work on the other side. These cost \$40 to \$70 per lineal foot. The gallery shed has no crib-work, but the roof is carried up against the mountain side by strong frame work. These cost \$15 to \$40 per lineal foot. These gallery sheds usually flank the typical sheds. The sheds are cut at intervals for light, ventilation and to arrest fires, and opposite these cuts are screen fences or glance works arranged with a strong apex up hill in the path of the snow slides and wings curving off to direct the snow to the point protected by sheds. A summer track is often carried outside of the sheds for greater security against fire, and to permit travelers to see the country as they pass. The total expenditure for snow-sheds and other work for snow protection has been \$2,900,000, and it is proposed to expend \$200,000 more to complete the system.

When snow-sheds are near together the telegraph line is carried by underground cable, and the only interruptions of telegraphic communication along the road last winter were from windstorms, and in no case was communication cut off more than four hours.

Of course expensive protection against fire must have been provided for the sheds and other structural works, as well as for the preservation of forests. In many cases flumes are carried along the roofs of sheds and filled with water from the mountain brooks. In other cases pipe lines are laid through the sheds. The locomotives are provided with hose connected to the injector by globe valves, and tanks of 6,000 gals. capacity are kept on flat cars at sidings.

The snowfall of 1886-87 was the heaviest ever observed in the Selkirk country, exceeding 35 ft. at the summit of the range. Eight and one-half ft. fell in six days. The sheds stood up well, although loaded with snow 50 ft. deep, and weighing 30 lbs. per cubic ft.

One valley shed not entirely finished was struck by an avalanche, and the roof carried 200 ft. up the opposite side of the valley. The shed was filled with snow which was piled 30 ft. above it, and in clearing it out empty spaces were found in the shed large enough for a man to pass through, evidently caused by the confined air, indicating the rapidity of movement of the snow slide. A rock slide of 100 cu. yds. passed over one of these sheds, leaving a rock of 10 tons weight on the roof.

The avalanches start sometimes 4,000 or 5,000 ft. above the level of the track, and bring down a quarter of a million cubic yards of material. They creep over the slope of a glacier or of old packed snow till a steep slope is reached, and then with tremendous velocity sweep down into the valley, sometimes crossing it and ascending the opposite slope 200 or 300 ft. Sheds more than 100 ft. above the valley have been struck by avalanches from the opposite slope. The avalanche is accompanied by a hurricane, locally called a "flurry," which uproots trees or snags off their tops to some distance either side of the path of the avalanche, and against these flurries the trestles and bridges must be protected by guys. The Superintendent of the Pacific Division is confident that with the additional ½ of a mile of snow-shed now planned there will be no further serious interruption to traffic from avalanches.

Mud slides have given great annoyance in the Selkirks, particularly on the western or wetter slope. They have often necessitated cleaning out cuts with steam shovel and derrick, and are guarded against by double rows of piles, 8 ft. apart on each side, braced, and the space between filled with gravel, which is also used behind the outer row of piles.

The bridging in the mountain section is entirely of wood, except the cantilever over the Fraser. There are in the Selkirks three bridges, 154, 175 and 294 ft. high respectively. The last, the Stony Creek bridge, is 490 ft. long, with one span of 172 ft. It will soon be replaced by a steel arch springing from the sides of the V-shaped ravine about half way up. The metal bridges east of the Rocky Mountains are of heavy pattern, designed by the late C. Shaler Smith, M. Am. Soc. C. E.

By crossing the Selkirks instead of going around them in the Columbia River valley the road is shortened 80 miles. Leaving the Valley of the Columbia, the line crosses the Gold range through Eagle Pass, the summit being only 1,800 ft. above tide. From the western side of the Gold range, the line follows the shores of lakes and rivers draining into the Pacific. Here is heavy work and tunneling, but it is when the line descends the Fraser River, cutting through the Coast range, that the heaviest consecutive 100 miles on the whole route is encountered. This section, built by the government, costs about \$10,000,000 without rolling stock or stations. There are numerous tunnels and rock cuts and a cantilever bridge of 300 ft. span, designed by Mr. C. C. Schneider, M. Am. Soc. C. E., crosses the Fraser River. This was the second cantilever built on this continent.

Divisional points are established at intervals of 125 miles. At these points, tracks, round houses, etc., are laid out on a standard plan. At alternate divisional points repair shops are established. At all divisional points are water tanks, 40 ft. high, to give sufficient pressure for washing out engines, and at the alternate divisional points are wrecking cars, pile drivers, tool cars, bridge and track material and other emergency material. In the new country, stations are arranged at intervals of 16 miles, passing tracks are laid about half way between these stations, making the crossing interval generally eight miles. This is reduced where there is considerable traffic.

The fuel supply is: Nova Scotia coal for the Eastern system; Pennsylvania coal, from near Ottawa to Brandon, the first divisional station west of Winnipeg; and west of Brandon, Canadian tertiary coal from the Bow River deposit is used

until it is met in the mountains by Pacific Coast coal from Vancouver Island. The Bow River coal is estimated to be with in 15 per cent. of the value of Pittsburg coal. Anthracite is being worked alongside the main line in the Rocky Mountains, and is used for passenger cars and domestic purposes as far east as Winnipeg. The Bow River coal area is estimated to contain three hundred and thirty millions of tons, and will be the chief source of the supply for the prairie region. Natural gas has been discovered in boring for water near the foot hills, and is used for pumping at two of the company's stations.

The locomotive equipment of the Canadian Pacific has already been described, in more or less detail, in the *Railroad Gazette*. The consolidation locomotives working in the Selkirk Mountains are equipped with the Westinghouse brake on the two forward drivers, the American steam brake on the two rear drivers, and the water-brake. The automatic brake is used ascending grades, and straight air descending, with hand brakes manned. The block system with telephone addition is extensively used in the mountains.

In winter, the consolidation engines are provided with heavy pilot ploughs. These ploughs are made of 5-16 iron double plated at the nose, with steel angles and 6 in. by 1 in. iron strap stays. The height of the nose is 5 ft., and of the wings, at their extremes, 7½ ft., clearing a width of 9 ft. at the bottom and 10 ft. at the top. These ploughs are often used ahead of the larger winged ploughs. For the efficient working of the snow-plow train through the mountains, it has been found necessary in many places to move the line out from the hillside to leave room for the accumulation of snow on the slopes. In descending long heavy grades the freight trains make frequent stoppages to cool off, and prevent the breaking of the cast-iron wheels from excessive heating by the brakes. On the Selkirk division, 72-lb. steel rails are used with 3,500 ties per mile.

The company have omitted no precautions to secure the safety and comfort of passengers. For hundreds of miles no supplies can be procured except by train, and in view of detentions, each through train, from Montreal, in addition to the dining car supplies, carries in the baggage car an emergency box of provisions to be used exclusively for passengers, and only in case of necessity. Besides this, at nine points in the Selkirks and Eagle Pass, where detention by snow slides is possible, provision magazines are established in safe positions, at intervals of ten or twelve miles, so that no train may be caught more than six miles from food. These provisions are emptied in the spring, and replenished by fresh supplies in the autumn. Coal and oil supplies are also similarly "cached," and emergency fuel for the locomotives. Bridge and track material is held loaded on cars to shorten detention of trains. Extremes meet; the voyagers of the Hudson Bay Company, Arctic explorers, and hunters and trappers in the mountains, cached their surplus stores against the ravages of fire, wolves, the wolverine or the polar bear; and now the most recent specimen of the highest type of transportation confirms by its emergency magazines the wisdom of the pioneers in the old times before the railroad era.

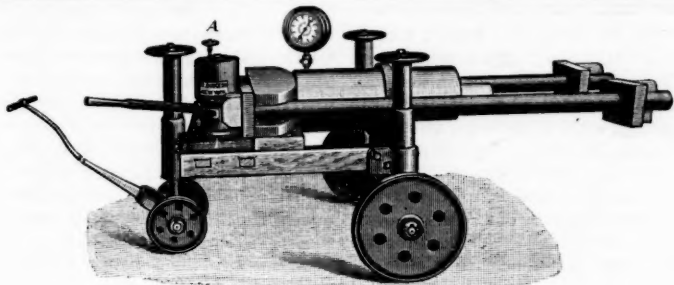
For local passenger traffic, which from the sparseness of population has, like the freight business, to be created, there is chiefly that of prospectors for minerals and timber, ranchmen, miners and lumbermen, and settlers in the new towns, which can be regarded as tributary to the road. Through traffic with all the Pacific Coast is competed for, and tourist travel is specially cultivated. For this, the route through the mountain region offers exceptional attractions, and no expense has been spared to make the most of this class of traffic. The hotels at the National Park in the Rockies, and at the terminus, Vancouver, are, like all the company's equipments, modern and complete. The scenery is Alpine, the route the only glacier one in America, and comfortable hostleries have been established in the mountains for stop-over tourists or sportsmen wishing to hunt the Rocky Mountain goat, now almost limited to these latitudes; the big horn, the grizzly and the mountain lion; or further north the caribou, and in the foot-hills deer, elk and antelope; or to cast a fly in the trout streams and lakes of the mountain region.

Electric Lights in Signals.

Below will be found an account sent us by Mr. W. W. Slater, Master of Signals of the Southern Pacific, detailing the experience of that road in its lighting signals and switch lamps at Oakland, Cal., with incandescent electric lights. He says:

Our plant comprises one No. 8 65-light Brush dynamo, driven by an ordinary slide-valve 36 H. P. engine and generating a current of 9.6 amperes; 30 are lights of the Brush pattern, five incandescent lamps of from 25 to 65 candle power (these five being equivalent to about two arc lamps), three series each of eight 16 candle-power Swan lamps arranged in multiple and six series of 11 or 12 lamps each arranged in the same way. The latter six series light signals and switches; all the other lights are in the depot, offices and yard. This gives us a total load equivalent to 41 arc lights on the circuit.

We first introduced the incandescent lights in our signal system on May 30, 1887, setting in eight lights (multiple system). On June 16 we added another lamp to this series: June 21, two more, and on Aug. 24 another, making 12 lights in one series. The lamp requires a current of 1.2 amperes to give its normal 16 C. P. light, but by putting 12 in a series the current is lowered two-thirds, or to .8 of an ampere, giving a light equal to about 10 candles. This light, passing through the corrugated lens of the lantern, gives a bright, clear, steady light, strong enough for all practicable purposes, and insure



Elevating Hydraulic Crank-pin Press.

Made by RICHARD DUDGEON, New York.

a long life to the filament of the lamp. These lamps, without any care or attention, other than occasionally cleaning the glass lens on the outside of the lantern, have been burning 2,500 hours to date, or a portion of every night for one year and sixteen days, and are probably good for another year—this, too, without a current governor or regulator on the circuit. The average life of these lamps, when burning to their full capacity, is about 500 hours. We have not lost a lamp by burning out in this or any of the other series in signals. Aug. 23 we put in another series of 11 lamps; Dec. 23, 12 lamps; Dec. 24, 11 lamps; May 4, 1888, 12 lamps; May 31, 12 lamps; making a total of 70 incandescent lamps in the signal system. Of these, 34 are in semaphore signals, 18 are in pot or ground signals, 17 in switches and 1 in target stand. Our main leading wires are run overhead in the usual manner, with No. 4 Brown & Sharpe gauge, underwriter's wire and branches from these wires to signals, etc. The pot and switch signal lamps on the ground are connected to main wires by lead-in-cased cable laid in boxing about a foot below the surface. Around the wires, in the boxing, we poured in pitch and tar melted together in equal proportions. We use the ordinary switch and pot signal lantern furnished by the Union Switch and Signal Co. for our ground signals, substituting in place of oil burners a hard wood base with rubber nipple in centre, on which is screwed the lamp socket; two binding posts are fixed on front of base, from which wires are run to the socket through the rubber nipple. A rubber tube midway between the binding-post passes down through the base, lantern and iron casting on which lantern is secured; through this tube the wires from the underground lead cable reach the binding post. This method of connecting wires allows the signal movement to be taken apart for repairs and oiling without breaking or cutting the wires. For the semaphore signals we have devised and use a lantern made specially for the purpose; it is made of one sheet of tin, and is $7\frac{1}{2}$ in. wide, 3 in. thick, and $8\frac{1}{2}$ in. high, with one $6\frac{1}{4}$ in. lens on each side. The top and sides are soldered tightly together so that no dust or dampness can get in. The bottom is fitted with a hard wood base $3 \times 7\frac{1}{2} \times \frac{3}{4}$ in., and held in place by two wood screws at one end, which serve the purpose of hinges; the other end is secured by a thumb screw. The inside of lantern is painted with white lead; the outside is green. The lamp socket is screwed on a rubber nipple in middle of base, through which wires run from the outside to the lamp. The lantern is fastened in position on the signal post by the usual iron bracket and socket in the side of the lamp. All the wires on the signal posts are secured by small boxing or rubber tubing.

The average cost of one oil lamp for one month is 65 cents for oil and labor in cleaning, filling, and lighting, and about 25 cents for depreciation on lanterns, lamp bottoms, burners, etc. The average cost of electric light for one lamp for one month is 30 cents. For the loss by depreciation of lamps, and machinery, oil, waste, etc., we have no data on which to base an estimate, but the amount is inconsiderable when taken in connection with our other lights. With proper machinery, regulation, etc., it is possible the cost of coal could be reduced one-half. The original cost of wire and material for electric light plant will compare favorably with the cost of expensive oil lanterns. Our engineers express themselves as much pleased with the electric lights in signals. The signals are always lit; the light is brilliant; there is no dirt or smoke, while on the other hand, the oil lamps are hard to keep burning in variable draughts of air, cover the lanterns with smoke and carbon and the signals with oil and dirt, and it is quite often necessary to relight some of the lamps during the night.

Dudgeon's Elevating Hydraulic Wheel Press.

The above engraving represents a horizontal hydraulic press for pressing in and removing locomotive crank pins. It can also be used for pressing on and off small car wheels.

It is hung upon three screws mounted on large wheels, stands 21 in. from the ground to the centre of ram and has a vertical adjustment from that to 43 in., in order to accommodate it to any unevenness of ground or varying heights of work without blocking, etc.

It has two pumps, one small and one large. Both work by the same lever, at the same time and by one man. When speed is required both are used, giving a movement to the ram of $\frac{1}{4}$ of an inch per stroke and a pressure of 30 tons. When the full capacity is required the large pump is opened by means of the wheel A and only the small one used. To return the ram after pressing, the valve is opened by depressing the lever, as in the ordinary Dudgeon hydraulic jack. The ram will then return, being forced back by means of a heavy spiral spring within the cylinder, thus saving much time and labor in prying it back as was formerly done. The component parts are made of the following materials: [forged

steel cylinder, ram and side rods, wrought iron yoke, washers, and elevating screws which work in steel nuts, steel pumps with hardened steel pistons, which come in contact with packing only, thus reducing the chances of wear or damage to that most vital part of all hydraulic appliances.

Any further information can be obtained of the maker, Richard Dudgeon, New York.

The Curtis Separator and Steam Trap.

The accompanying illustrations represent a combined steam trap and separator recently introduced by the Curtis Regulator Co., of Boston, Mass.

The wasteful effects of entrained water in steam are well known, and many devices are in use for separating the water held in suspension in steam. The separator shown is placed in the steam pipe between the boiler and the engine.

The steam in its passage through the separator is sharply deflected downward and then as sharply deflected upward. The steam readily accommodates itself to these changes of direction, but the water and solids carried along with it are carried onward by their momentum, instead of turning with the steam, and are projected against the inclined faces of the deflector and gradually fall in a stream flowing downward to the base of the separator.

The lower edge of the deflector plates are trimmed to such an angle that the water and grease cling to the plate until they reach the point of contact with the shell, and then, being entirely out of the current, flow quietly to the bottom. Any of the lighter particles of matter that may have remained in the steam current after the first turn are simply thrown out in the next and fall in fine spray against the bottom and sides of the shell.

The water in the base is removed by a Curtis patent balanced float trap. The valve is double seated and balanced, and the spherical metallic float is warranted to stand 140 lbs. pressure per sq. in. Through the stem and centre of the valve the interior of the float is in communication with the atmosphere, insuring it against filling with water. The valve area is very large, and the whole can be blown out at will by means of a bye-pass valve. A glass water-gauge at the side shows the water level. The sediment being heavier than water, settles to the bottom, and can be removed at pleasure by taking off the cover which removes the float and exposes the interior to inspection. The grease being lighter than water, floats on the surface and can be drawn off at intervals through a grease-cock located at the water-line of the trap.

The Prohibition of Pools.

[F. L. GREENE in July Century.]

Observers "have noted the present tendency of opinion towards an increasing interference with or control of public industries on the part of government; or, in other words, the spread of state socialism. The message of Mayor Hewitt advocating the building of rapid transit lines by the city of New York is a striking illustration. Ten years ago such a proposal would have been met with a great outcry, with an insistence upon the Jeffersonian maxim, "that government is best which governs least," and with a warning that we were

departing from the democracy of our fathers. The New York and Brooklyn Bridge does not earn interest upon its cost, and hence all real estate is taxed to provide comparatively free transportation for a certain portion of our citizens. The bridge and the rapid transit plan excite no opposition as to the principle, but only as to details. From such instances as these to the state management or more strict control of our other public industries like the telegraph and the railroads, is a step of little difficulty as to the theory, however great the practical difficulties may be.

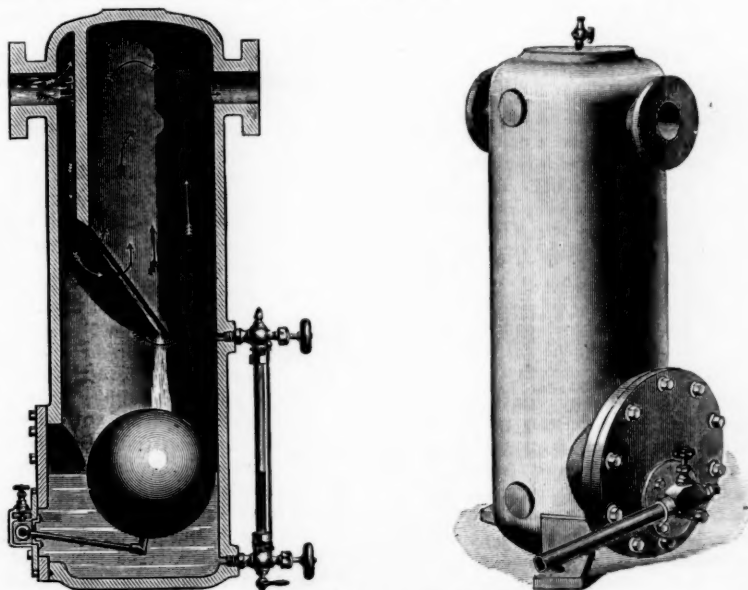
No section of the Interstate Commerce law has met with more censure on the part of some students of our transportation problem than the one prohibiting railroad pooling. Pools, they say, have brought uniformity and comparative steadiness into our railway system where everything before was chaotic; pool failures arose from the fact that they could not enforce their agreements; hence the solution of our difficulties lay in legalizing, not abolishing, these combinations. The credit claimed for the pooling system in bringing harmony of administration out of confusion is justly due it. But transportation methods should be evolutionary, and it may well be that we should now pass beyond pooling and allow pool questions—the division of the traffic and the fixing of rates—to be settled by more natural methods and through more real competition. The legitimizing of railroad combinations by law would shortly compel the direct interference of the same law-making power with the tariffs or special rates of the pools thus legalized, for logically Congress would be held responsible for any and all transportation charges made by its creatures. This would be a long step towards strict control and eventual ownership. As matters stood at the time of the passage of the Interstate Commerce act, the pools were gaining strength greatly, so much so that astute men were looking forward to a pool of pools which should cover the larger part of the country. Even allowing for the indirect competition of our water-ways, there would be power enough in such a gigantic pool, when formed, to require governmental action to restrain it. In this view of the case the prohibition of pools might be described as an effort of the American people to avert government ownership, or at least exacting regulation of railroads.

We are witnessing a struggle between the theories of competition, or individualism, on the one hand, and on the other of state control of those monopolies which are public in their character and chartered by the government. As before remarked, in municipal affairs we are rapidly deciding against individual and in favor of city administration. Around the railroads of the country will finally be fought a battle which, on account of the difficulties and conflicting interests involved, will be the fiercest of all. If this prohibition of pooling, which is but an experiment, shall prove disastrous to investments and to commerce through repeated railway wars; or if, which is its undoubted tendency, it unduly favor a consolidation of existing independent lines into fewer great systems, so as thus in time to defeat its own hopes of introducing enough honest competition to be a regulator of charges; if, in short, we must confess that the abolition of a division of the earnings between rival railroads has proved a failure, then the great question of individual versus governmental control of transportation will be upon us. If this question be squarely presented to our citizens, judging from the present aspect of affairs, we cannot doubt what the issue will be. The prohibition of railroad pooling, it is to be hoped, will at least postpone that conflict until, through a better civil service and in other ways, the nation is ready for the question.

The legalizing of pools would have precipitated the struggle; ignoring them would have delayed it; prohibiting them has postponed and may avoid it; while in the event of its coming we have the satisfaction of knowing that we have done what we could towards keeping the simpler forms of our government.

Old Machine Tools.

Several of the early machines made by Richard Roberts, illustrating the first development of some of the best-known machine tools of the present day, have been presented to the proposed Whitworth Museum, at Manchester, England. One of these is an old planing machine, the date of which is unknown, but which is believed to be one of the first planing machines ever made. The table of the machine is worked by a chain, and for occasional jobs it has been kept in work right up to the present. Another machine is a wheel cutter, which was made by Roberts in 1820, and as regards design, so far as its mechanical details are concerned, it has very few features essentially different from those of modern tools. There are several other tools made by Roberts, which are of special interest, showing that some supposed recently introduced mechanical operations are by no means such modern innovations as seems to be generally believed. Amongst these is an old milling machine, dating so far back as 1843, and in the mechanical arrangements of which there are comparatively few points of really very material difference between this early machine and the modern tools of a similar type, which have been introduced during the last few years.



Combined Separator and Trap.

Made by the CURTIS REGULATOR CO., Boston, Mass.



Published Every Friday,
At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS.

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Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The convention of the American Society of Civil Engineers, which has just come to an end in Milwaukee, was one of the most delightful of a long series which have made the outings of the Society famous. Heaven began smiling the first morning, and kept at it to the end. The sky was cloudless, the temperature just right, and the lake sparkling. Mr. Whittemore and the local committee were unwearied in their attentions, and the people of the city were most hospitable. For the meagre technical results of the convention, concerning which we have something to say in another column, neither the local committee nor the people of Milwaukee can be held any way responsible unless it may be in having done too much to entice the visitors away from their work. A report of the proceedings will be found on another page.

In another column will be found an interesting account of an experiment in lighting signals and switches with incandescent electric lamps. The author gives a very clear idea of the apparatus and methods employed, and of the running expenses; but it is to be regretted that he did not also state the cost of fitting up the signals, etc., with the electric lamps. He notices several important advantages in these lights over oil lamps, and draws very favorable conclusions from the experience thus far. Of course, such a system is applicable only where many lights are grouped together in a small area, as in the case of a railroad yard equipped with interlocking. There are doubtless many such where they might be used with advantage; where, as in this case, electric lighting is already in use, and the signal and switch lamps are merely a slightly additional load on a machine already running. Under such circumstances the cost of plant is very small. The case would be quite different, however, if an engine and dynamo were purchased especially for lighting signals and switches. The interest on the cost of plant and depreciation would then be a much larger portion of the running expenses, and it is doubtful if the cost of lighting in this manner could ever be as low as by oil. There are, however, some great advantages, as the brilliancy and constancy of the light, and that the signals are always lighted, keep clean longer, and require less labor to keep the lights in order. This, we believe, the first application (at least in this country) of electricity for this purpose, and the results of the continuation of the experiment will be of interest.

Automatic and non-automatic signals, and their differences, are the subject of a letter in another column. Automatic block signals worked as described by "H" are danger signals (when in the danger position) until an approaching train has come to a full stop; after that they are only caution signals, as the runner must, under certain conditions, go on while the signal continues to stand at danger. Whether such a signal as this should show red or green; whether it should be more like a stop signal or more like a caution signal, is perhaps a question. An ordinary distant signal—dove-tailed semaphore, or green light—

says distinctly, "You need not stop here"; a home signal says "You must stop here"; an automatic block signal also says "You must stop here," but in the latter case the engineman may decide for himself whether to go on (after stopping), while in the other the signalman must decide for him. That the semaphore principle may be retained and still have sufficient difference between these three classes of signals, seems entirely practicable, in fact is not denied by our correspondent. An advantage of the semaphore, which is not sufficiently appreciated, is the fact that with it the relative position (not location) of the signal can be availed of at night as well as by day, thus avoiding danger from color-blindness, and certainly eliminating one chance of error. With the illuminated semaphore blade this advantage is still more pronounced. Doubtless automatic block signals often fail of appreciation because our correspondent's idea is not sufficiently recognized. One officer will not have them unless they can be a positive stop signal, while another, going to the opposite extreme, is too ready to use them as mere cautionary signals. It is a matter of common experience that exact obedience to cautionary signals or those which are habitually in the caution position is one of the hardest kinds of obedience to enforce.

As for the strictness with which the authority of home signals (as in interlocking systems) can be maintained, "H" must have found in practice, whatever may be his theory, that 1 in 10,000 is a hard ratio to maintain. So long as running past a square-end horizontal semaphore is not punished by instant discharge, there seems to be an irresistible propensity to evade the requirements of the rule in one way or another. Even if it were the subject of severe penalty, the inspector would have to make a good many night visits to his yards to detect all the transgressions. When it comes to actual working, the difference between the signalman's giving authority to disregard a signal and the engineman's taking the authority on his own motion may not be very great. If signalmen had no inducements to use hand or flag signals except such as arise from derangement of apparatus the problem might be an easy one; but considering the frequency with which their penchant for creating a "soft snap" comes in to warp their judgment, the inspector who aims at good discipline must have his eyes open at least seven days (and nights) in the week. Whenever it becomes as easy to travel by the circuitous road as to cut across lots, safe signaling will have made a decided advance.

We notice with interest the resolution of the Chambers of Commerce of Minneapolis and Indianapolis against the movement in the East to put export and domestic rates on the same level. The Northwestern people see clearly that the effect of such action would be to limit their market, and to lower the prices which they could command. The case at present is as follows: The United States produces more than enough wheat for its own consumption. It must dispose of the surplus in foreign markets, or not at all. In these markets it comes into competition with wheat shipped on routes outside of the United States. We have a choice of three courses; to allow a difference between the foreign and the home rate, to reduce the home rate to the level of the foreign rate, or to abandon the competition altogether. The Commission is trying to prevent the first; the railroads cannot do the second without commercial disaster; these chambers of commerce are right in dreading the third of these alternatives. The danger may be less than they suppose, but it is a real one. It is the chance of disposing of surplus stock which affects prices. Anything which increases the difficulty of marketing our wheat abroad must produce an additional fall in wheat prices. The evil effects of such a fall would probably far outweigh any good which the seaboard cities could obtain from the interference of the Commission in their behalf. Probably action will be taken in the matter by other Western cities.

The recent completion of a 2-ft. gauge line in Colorado recalls the commencement of the movement in favor of narrow-gauge roads. The line in Colorado runs some 10 miles from Black Hawk to a mining region, and is chiefly engaged in carrying ore, and a considerable excursion traffic is expected. It therefore closely resembles its first prototype.

It will be remembered that the narrow-gauge controversy was first started about 20 years ago by the success of the Festiniog Railroad, a little Welsh line of 1 ft. 11½ in. gauge. The success of this line was attributed to the gauge, but unfortunate and costly imitations of it afterwards proved that it was due to the exceptional nature of a traffic peculiarly suitable for an extremely narrow gauge. Carrying roofing

slates down hill was an easy and remunerative task for the Festiniog, as slates are heavy for their bulk, and can afford high rates per ton. The line, though utterly unable to deal with bulky freight, or to run at anything but a very moderate speed, paid very well, and created a wave of enthusiasm in favor of narrow-gauge lines. This feeling was encouraged by the strenuous advocacy of the late R. F. Fairlie, the inventor of the double-bogie locomotives by which the line was worked. Mr. Fairlie was aided by Mr. C. E. Spooner, the principal officer of the miniature road, and the novelty of seeing an engine of peculiar construction draw a long string of cars up a miniature track, winding up a tortuous Welsh valley, situated amongst most romantic mountain scenery, appeared to substantiate the arguments of Messrs. Fairlie and Spooner, and attracted the attention of enthusiastic inventors, Russian princes, and sanguine capitalists toward the shortcomings of the 4-ft. 8½-in. gauge and the manifold advantages to be secured by a reduction to 3 ft. 0 in. or some lesser distance. Millions of money were put into the narrow-gauge craze, everything about the standard gauge was too heavy, and in future rolling stock must be made of the lightest and most flimsy construction, and the paying load must bear a larger proportion to the dead weight of the train. The advocates of narrow gauge pleaded that these advantages could only be secured by their system, and showed drawings and even photographs of twenty-ton cars which weighed 5 tons. The apparent saving in weight enlisted the support of stockholders and capitalists, and thousands of miles of narrow-gauge line were constructed, especially in this country, France, India and most of the British Colonies. With one exception, all the leading technical and engineering papers of the world were in favor of narrow gauge. The exception was the *Railroad Gazette*. The subsequent story of the narrow gauge hardly needs retelling. It was soon found that, in homely language, a donkey cannot do a horse's work. The light weight engines and cars needed constant repairs and were soon worn out. The slow speed, the cramped capacity of the cars, the insufficient grate surface of the engines, and the cost and annoyance of transshipping freight at transfer points combined to render it impossible for narrow-gauge roads to compete with those of standard gauge. Rails weighing 30 to 40 lbs. per yard were also found to be a mistake, while the saving of a few inches in the length of the ties proved infinitesimal. Narrow-gauge railroads have been found utterly inapplicable to a large and general main line business, and it is generally conceded that they are only advisable under exceptional circumstances, and where the traffic is never likely to be large and the lines are isolated and no connection with lines of standard gauge is probable. Consequently in this country there is now no considerable narrow-gauge road. The standard gauge reigns supreme, and any departure from it is relegated to its proper use, small isolated local lines, where cheapness of first cost is the paramount consideration and no transfer of freight is needed.

The experience in other countries has been very similar, and in only three of the British Colonies, New Zealand, the Cape and Queensland, is the narrow gauge used for main lines to the exclusion of a wider gauge. In France and India, and to a lesser extent in other countries, an extensive system of cheap narrow-gauge lines is used as an adjunct to the standard-gauge lines. But even for this purpose it is now generally recognized that a line of light and cheap construction, but of standard gauge, can be built and worked as cheaply as a narrow gauge, and further, is free from the disadvantages of needing special rolling stock and arrangements for transfer and transshipment at junction points.

The Fall in Railroad Securities.

The ordinary fluctuations of the Stock Exchange are of little interest to railroad men. In the majority of cases they spring from causes outside of the domain of railroad business. One day a scarcity of money causes a pressure to sell stocks, and a fall in quotations, even though there is no lack of confidence in the investment itself. A few days later an "oversold" market causes a rush of small speculators to "cover their shorts," and prices go up. In neither case is the price movement much affected by any estimate of the permanent value of the property. Bulls and bears may make use of all sorts of statements, true and false, with regard to the earning power of the various systems; but they value such statements for their effect on the temper of the market rather than for their indications with regard to the properties themselves.

But while this is true of the variations from day to

day, in the long run the conditions of business will have their effect on values. Wall street cannot live on Wall street. The price manipulations from day to day may be the result of a game between stockbrokers; the variations from month to month depend upon the temper of investors. To the man who speculates in margins, a false report which is believed may be of more importance than a truth which is ignored; but to the investor, the latter is the important fact, and sooner or later speculators' prices must conform to investors' prices. Thus it happens that while the movements of the stock market from day to day may indicate very little, those from month to month indicate a great deal. The stock exchange figures for the past year furnish a most instructive side light on the conditions which have affected railroad business during the period in question.

The movement of prices has been by no means violent, but quite distinct. The prices with which the year 1887 opened were maintained all along the line with a good deal of steadiness up to May or June of that year. In some parts of the country there was a distinct advance in the value of railroad securities during that period. Thus Chicago & Northwestern advanced from about 112 to 127; Rock Island from 125 to 140; C., B. & Q. from 137 to 156; Atchison from 97 to 118; St. Louis & San Francisco preferred from 63 to 84. These are simply marked instances in a rather general upward tendency. The reason for this is not far to seek. This was the time when the Interstate Commerce Law first went into operation, and every one was surprised to find that it worked so well. In some respects it was increasing the earnings of the roads. The abolition of the free pass system had given a new source of income from passenger traffic. The attempt, largely successful, to do away with special contracts and personal discriminations had virtually raised freight rates more than any alterations in the tariff had lowered them. Under the stimulus of new-born virtue, and amid the general feeling of contentment, rates were well maintained without the aid of pools. The short haul clause had not proved either so rigid or so dangerous to railroad revenues as was at one time feared.

In short, the law in its first workings was by no means disadvantageous to the roads; and their managers assumed that this state of things would last. A piece of legislation, long under discussion, was now an accomplished fact. Both the managers and the investors supposed that many vexed questions were in the way of settlement, and that we were at the beginning of a long term of prosperity. The managers extended their systems in every direction; the public seemed ready to invest in railroad securities, both old and new.

The reaction came sooner than most people, even of the wiser sort, expected. It was found that the prosperity, though real, had been overestimated; that net earnings were not increasing as fast as gross earnings; that it was a question whether rates could be maintained under existing conditions. Much of the new railroad building had been premature. There was no assurance that it could even indirectly cover the fixed charges which had been incurred for its construction. Prices of securities ceased to rise and soon began to fall rapidly. In August the general level of prices was no higher than it had been in January. From that time on, the fall, though neither rapid nor constant, was nevertheless continued. The stocks which had risen fastest at the beginning of the year often showed the reaction most strongly. A temporary rise was commonly followed by a still greater loss. If we compare some of the closing prices of last week with those for the corresponding date the year previous, we find the following results:

	June 30, 1887.	June 30, 1888.
Atchison, Topeka & Santa Fe.....	115½	84½
Central Pacific.....	39	30¾
Chicago & Northwestern.....	119½	166
Chicago, Milwaukee & St. Paul.....	89	63¾
Chicago, Rock Island & Pacific.....	131	102¾
Illinois Central.....	122	116
New York Central.....	109¾	105¼
New York, Lake Erie & Western.....	32¾	24½
Northern Pacific.....	33¾	23¾
St. Paul, Minneapolis & Manitoba.....	117	101½
Union Pacific.....	58¼	54½

Had this fall occurred in a commercial crisis it would not have been remarkable. But coming at a time when credit was undisturbed, business expanding and prices of goods fairly well maintained, it shows that railroad business was subject to adverse influences which require special attention. We have already indicated to some extent what these were. It is worth while to look at them more in detail.

1. It should be noted in the first place that the railroad extensions of 1887 could at best secure only a slight margin of profit from much of their traffic. With wheat at its present price, there is by no means the money to be made in the wheat traffic that there was a few years ago. To a less extent the same thing is

true of other articles which contribute a large share of our railroad tonnage. It may be that the country needed 12,000 miles of new road in 1887 as much as it needed 10,000 miles in 1881 or 1882; but it is certain that the fall in prices during the intervening period has left it impossible for the country to pay for the traffic on the same scale. Business for the new roads was to be had; but it must be done at rather low rates. Thus we find that while gross earnings increased, it was by an increase of volume of traffic rather than of rates; nor was the increase in gross earnings always accompanied by any corresponding increase in net earnings by which the fixed charges on the additional mileage could be met.

2. Meantime the Inter-state Commerce Law had rendered it impossible to make rates on purely business principles. Whatever had been the abuses of the old system, it at any rate enabled the roads to develop with the utmost freedom any traffic which they thought profitable. They could make low rates for large distributing centres, whose traffic was regularly supplied and economically handled. It is doubtful whether their policy in this respect was wise in the long run; but there can be no question at all that the sudden stoppage of the policy was a hardship both to the railroads and to many of their patrons. It involved a rather sudden readjustment of trade in new channels, with a great deal of inevitable loss. The short haul clause, if strictly applied, meant that the railroads could not make low through rates unless the conditions of local business warranted them. It may have been good public policy; it has not always been good railroad economy.

3. The idea that the Inter-state Commerce act was to settle the public mind in its attitude toward railroads proved totally wrong. It simply gave the signal for a great deal of state legislation, some of it quite radical in its provisions. Opinions may differ as to the actual effect of the work of the state authorities in Iowa or in Minnesota; but the mere readiness to take such action is in itself an important cause for the fall in railroad values. It is a dangerous indication as to the temper of the public mind. Such manifestations affect the value of railroad investments in the same way that forced compromises and refunding schemes affect the value of government bonds. The result is not measured by the mere difference between the old and the new rates of interest. The sense of insecurity on the part of the investor is a still more potent factor.

These forced reductions are all the more dangerous because from one point of view they are at least partially justified. The original cause of the whole trouble was in large measure independent of individual railroads or legislatures. It was the fall in the price of wheat and other commodities. With wheat at \$1.15, there was money both for farmers and for railroads to make rich return on the investment. With wheat at \$0.70, there is no such margin. There is a loss to be divided instead of a profit. Each party tries to shift the burden on the other; the railroads, by avoiding reductions as much as possible, the farmers by radical legislation. Either extreme is bad, because the interests of the two parties to the question are so closely bound up with one another; but when a man is so situated that he looks at one side only, it is almost inevitable that he should fall into one of the extremes.

While the railroads thus suffered positive injury from over construction, from forced readjustments of rates, and from the liability to destructive legislation, they were also deprived of one of their accustomed means of self defence. It can hardly be doubted that the clause prohibiting pools has been a serious injury to American railroad property. As regards publicity and equality of rates we are probably better off than we were before the passage of the Inter-state Commerce act; but as regards their steadiness or their adaptation to principles of railroad economy, we are in many cases much worse off. While new responsibilities which require joint and harmonious action on the part of the roads have been laid heavily upon them, they have at the same time been deprived of the power of enforcing such action upon one another. While combinations among shippers and among laborers are increasing, such combinations among railroads are made a penal offense. It is too soon to predict what will be the outcome of this one-sided arrangement. It is even impossible to tell, as yet, just how much the pooling clause of the Inter-state Commerce act, has to do with the present depression in railroad securities. But it is certain that the attempt to combine enlarged responsibilities with restricted powers must work serious hardship upon the railroads, and cannot fail in the long run to react against the development of the trade of the country.

The Conventions of the American Society of Civil Engineers.

At the Milwaukee Convention the American Society of Civil Engineers sat under a banner bearing this inscription: "The high object of our profession is to consider and determine the economic use of time, power and matter." It must have occurred to many of those present that so far as regards time the profession did not attain to its high object when it assembled in convention. While one purpose of these conventions is to bring men together for personal intercourse, another purpose, and a purpose regarded by many as important, is to enable men to hear and take part in discussion of professional reports and papers. It is largely for this latter object that many, if not most, of those who go to the conventions spend their time and money. Socially, this convention, like most of its predecessors, was thoroughly successful; but as a gathering of engineers for serious public discussion of matters of professional interest it was certainly not successful, and those who went to it to hear themselves and other wise men talk in meeting must have read the words on the banner with some sense of disappointment.

The convention (for social purposes) lasted seven days, beginning Thursday morning and ending Wednesday night. Sunday must be included, for since most of the guests were gathered under one roof, Sunday was rather more favorable than any other day to interchange of personal visits. Tuesday and Wednesday after the official close of the Convention must be included, for these days were given up to excursions which all of those present were expected to take part in. In fact, the journey to Milwaukee was practically part of the Convention to those living in the East. Yet of the seven days but fourteen hours were set apart for the proper business of the Convention. But further, of these fourteen hours about three were lost by want of punctuality in opening the meetings, and at least one hour more was lost in making announcements and explanations that could have been much more satisfactorily made by printed bulletins. Ten hours, therefore, was all that remained for the serious work for which unquestionably a very large number of the members went to the convention. The seven days may be divided thus: Hours when no one wants to see any one else, 70; hours for informal intercourse and the pleasures of "society," 88; hours for professional papers and discussion, 10; total, 168. Some men, with a queer want of sense of proportion, grumbled at this "economic use of time." Moreover, a considerable part of this precious 10 hours was spent in reading long papers which had already been put in type, and which had been, or might have been, distributed and read at leisure before the sessions. As a necessary result, the number of topics introduced was very small, and the discussion of each was scrappy and inconclusive. Under such conditions the chances that a man who had traveled from New Mexico or Washington Territory to attend the Convention would hear anything of special interest or profit to him were very meagre indeed.

Notwithstanding the small number of topics presented there was no possible clue to the order in which they would appear, and consequently every member had to attend every session or run the risk of missing exactly what he wished to hear or to discuss. The inconvenience of this want of arrangement for one who wished to make calls in the city during business hours, or who wished to take half a day to examine works of special interest to him, was very great.

The by-laws of the Society say that the objects of the annual conventions are "professional discussion and social intercourse." Probably few men underestimate the pleasure or the profit of these occasions for meeting old friends and making new ones, or ignore the fact that to many the convention is a vacation from hard work, in which they seek recreation rather than instruction; but to most members the primary purpose of the annual convention of the American Society of Civil Engineers is still professional discussion, and they are ambitious that, for the glory of the Society and the profit of the individual, this discussion should be varied, comprehensive and thorough. Year after year the same complaints are heard of the faulty allotment of time and of the inadequate character of much of the discussion, and year after year matters do not improve.

Amongst the suggestions which have been made for improvement in the character and conduct of the conventions are the following:

(1.) Earlier and more thorough distribution of the papers and reports, which are to be presented. One step toward this was taken at this convention when the resolution was passed, directing that reports shall be in the hands of the

Secretary 60 days before the convention, and that drafts of them shall be distributed 20 days before; but so far as practicable, proofs of all convention papers should be in the hands of members so long before the time of meeting that they may prepare themselves for careful discussion. It is true that a list of papers and reports is sent to all members, and ordinarily one can get proofs of such of these papers as he wishes. But not enough time is given to procure proofs and prepare for discussion: many busy men will not take the trouble to send for proofs, but would examine them if they had them; points for discussion will often occur to one in reading a paper, which would not be suggested by its title.

(2.) As a rule, papers should be read in convention by synopsis or abstract only. The reasons for this are apparent. With printed proofs in hand abstracts would sufficiently suggest discussion, and the audience would not be worn out with the tedious recital of wearisome details.

(3.) Time should be still further economized by making all announcements by printed or written bulletins, by meeting promptly, and by following a prearranged programme. If it were still found necessary, the hours of session could be extended; but for a year or two, and until the members get in the habit of thinking that the convention really offers a chance for serious "professional discussion," 14 hours carefully used will probably be all the time needed.

All of this has been written on the assumption that the first great object of the American Society is professional improvement, that the social or honorary advantages of membership, while important, should be secondary, and that especial pains should be taken to make membership profitable and attractive to non-resident members. Probably the great majority of the Society would accept these assumptions without question, and those who object most strenuously to turning the Society into a debating club will admit that a higher standard in the discussions will draw to the conventions more of the best men in the Society, and will make them so much the more profitable in all ways.

The Rate Troubles.

Fighting for traffic by the trunk lines is on the increase. It has hardly taken the shape where it can properly be called a general war of rates. It is rather a series of skirmishes, some larger and some smaller, animated by no common strategic aim. They seem more like efforts of rival lines to measure strength than serious attempts at fighting. But they are none the less vexatious, and must sooner or later lead to actual war.

The most important of these fights affects both the live cattle and dressed beef traffic. The Pennsylvania is reported as giving live stock rates as low as 12½ cents from Chicago to New York. Dressed beef rates on all lines are now 23 cents, and it is possible that the differential lines will make a further cut. The worst of it is that it is impossible to see any end to all this. The newspaper talk about freezing out the poorer roads is nonsense. The managers of a weak road usually feel the burden of a fight less than those of a financially strong one. Those lines which pay dividends to the stockholders are much more affected by the loss of a part of their legitimate earnings than their rivals are by the prospect of an increased deficit.

Before the organization of the east-bound pools, the wars of live stock rates resulted in the establishment of the "evening" system—a sort of contract with outside parties for the division of traffic, something like that with the Standard Oil Company. This had all the disadvantages of a railroad pool, with none of its advantages. But the establishment of the trunk line pool had the effect of breaking up the system before it grew too strong for the railroads to meet it. There is some danger that the abolition of pools may result in its renewal. The dressed meat trade is now compactly organized; the business of live stock shipment is nearer organization than it was a few years ago, while the pooling clause of the Inter-state Commerce act makes it difficult for the railroads to meet organizations on equal terms.

None of the other fights have gone nearly so far as this; but hardly a day passes without reports of individual reductions on one line or another. Even the express companies seem to be affected by the prevailing tone, and are indulging in an independent fight on their own account. More serious than all these open and ostentatious reductions is the tendency toward weakness in wheat rates. Owing to the operation of the Inter-state Commerce law, special contracts under this head are more secret than they ever were, and it is impossible to ascertain the facts in detail.

The probable effects of lake and rail competition against the all rail routes this season were likely to be considerable, but could be fairly well calculated.

The proposed rates of the "Soo" line seem to involve a new danger. All-rail rates to Minnesota points of 60 cents first class or 20 cents sixth class are astonishingly low. But we believe the danger from this source to be exaggerated. In the first place, it is doubtful whether the Eastern connections can be brought to agree to such a rate; or, at any rate, that they will be satisfied with their share of these rates. In the second place, it is doubtful how much traffic the new line could divert, even at these rates. Of low-class goods, it might get considerable shipments; of higher classes, probably very little. To the shippers of valuable goods, a loss in promptness or responsibility more than balances any gain from lower rates. Each year makes this fact clearer. It was strikingly illustrated in the fight between the New York Central and the West Shore, when the latter, in spite of low rates, was able to secure very little high-class freight. The disadvantages of the "Soo" route in the freight competition are probably fully as great as those of the West Shore. To be sure its financial condition is much better, but its arrangements with its connecting lines are somewhat loose, and the chance of giving prompt and responsible service under such conditions does not seem at all good. That the Soo people themselves will make every effort to do it we have no doubt; but that they can induce the connecting lines to give the necessary co-operation, under a schedule of rates which hardly pays their ordinary expenses of freight handling, is much less probable. In fact, the New York, Ontario & Western has already announced that it will not join in the present reductions.

Furthermore, the Minneapolis, St. Paul & Sault Ste. Marie is not in a physical condition to handle business with dispatch, and it is doubtful if the Algoma branch of the Canadian Pacific is in better condition. On the whole, it is a fair supposition that this Northwestern cut is an expensive way of announcing that the new lines are in the field for business, and it is not likely to be long continued. The lake lines by Duluth and Washburn are much more dangerous competitors for the Northwestern business which has heretofore gone through Chicago than the "Soo" lines are or can be, and finally those lines must govern the Northwestern rates. It is reported that since certain Chicago-St. Paul lines have taken the responsibility of interpreting the Inter-state law in such a way as to allow them to make local rates higher than through rates, they have succeeded in regaining part of the business from the seaboard, but whether or not the Commissioners will agree with this interpretation remains to be seen.

Slipping at High Speed.

Some ten years ago M. Rabaut, an engineer on the Northern Railroad of France, noticed the slipping of locomotive drivers when running (and using steam) down grade, even without any train load to haul. He made several observations, and concluded that this slipping increased in some ratio to the speed, and that it was much greater at the same speed in descending than in ascending grades. He found, by measuring the distance run, and noting the number of revolutions made by the drivers in that distance, that the circumference of a driver multiplied by the number of revolutions gave a product from 13 to 25 per cent. greater than the distance. That is, fuel was wasted and tires and rails worn out by useless revolutions of the drivers. Several explanations of the phenomenon observed by M. Rabaut were offered at the time, and within a year M. Durand-Gréville has published in the *Revue Scientifique* the remarkable theory that in going down grade the wheels tend to get away from the rail by the amount of the vertical component of the motion of the locomotive, and in going up grade they tend to approach the rails by the same component. Hence, he reasons, there is less adhesion in going down grade and increased adhesion in going up. M. A. Stévant takes, in a recent issue of *L'Industrie Moderne*, space equivalent to about a page and a half of the *Railroad Gazette* to state the theory of M. Rabaut and the more or less ingenious explanations of it, and to show that these explanations are mechanical illusions. This he does very prettily, but one is surprised to find that after all the ingenuity and erudition which he has expended on the subject he accounts for the phenomenon by the simple and conclusive statement that it does not exist. In other words, "the boy lied" from the start. M. Stévant says that he made numerous runs between Liège and Verviers, registering the revolutions of the drivers, and found "no appreciable difference between the measured distance and the development of the circumference of the drivers multiplied by the number of revolutions." The distance between these stations is about 14 miles, and the difference of altitude about 400 ft. Moreover, M. Stévant made various long runs at high speeds with coupling rods removed, and found no appreciable change in the relative positions of the crank pins. He quotes various authorities, who sustain his position, that this particular kind of slipping does not occur. It seems probable that M. Rabaut's figures were the result of the singular conditions under which he made his experiments, putting the reverse lever in full gear when running down grade.

The statement that engines slip continually while running at full speed is often made, but almost invariably by persons of no practical experience, who appear to be unaware that any slip of the drivers can be instantly detected by an engine runner. Any one who has run a fast train knows that on entering a damp tunnel slipping occasionally occurs, but the vibration imparted to the engine is so peculiar that no one who has once felt it is likely to fail to recognize it again. Messrs. Abbey and Baldwin, when making some observations on the running of a Jersey Central express passenger engine on the Bound Brook route,* found that the slip at high speed was practically nil. The wheels, as calculated from their diameter, should give 298.98 revolutions per mile. A counter showed that 298.62 revolutions per mile had been actually made, the difference being negative and only ⅜ of a revolution per mile, or within the limits of errors of observation. As these engines are run very hard and made to do their utmost, it might reasonably be expected that they would show slip, if any existed at high speed. It is therefore reasonable to suppose that any continuous slipping at high speed is non-existent. The continuous slipping theory is supported by so very little evidence, either practical or theoretical, that it must take its place among the numerous other pseudo-scientific delusions.

The Proposed Form of Annual Reports.

A few weeks ago we published a full abstract of the form of annual report submitted by the Inter-state Commerce Commission. This was only provisional, but the form finally adopted shows few changes. At first sight it looks shorter, containing only 32 pages instead of 58; but a moment's examination shows that each of the 32 pages is double, and that there is really an increase of length. For this we are sorry; we thought it too long to begin with. The Commissioners seem to demand not merely an annual report but a financial history and census all combined.

The detailed changes are generally improvements; many of them were suggested by the *Railroad Gazette* when the provisional form was submitted for discussion. The financial questions on the opening pages are rearranged, but not otherwise greatly changed. The form of floating debt statement is vastly improved. On the other hand, these omit to ask the nature of the preference in favor of preferred stock—a most extraordinary omission.

The classification of different items is in many instances a decided improvement over that of the provisional form. The sub-headings under equipment are simplified as well as improved; those under construction are slightly expanded, but better arranged. The same may be said of the grouping of different classes of employes.

After the General Balance Sheet we find an entirely new page introduced under the title of "Financial Operations for the Year." Practically it is an unbalanced Treasurer's Balance Sheet. Why not balance it, make it what it really is, and put it where it really belongs—a dozen pages earlier? Another additional page deals with the nature of the security for funded debt in its various forms. To this no objection can be made, except that it belongs at a much earlier point in the report.

In the statistics of roadway a great deal of useless detail about American and foreign iron and steel rails in different states has been omitted. In its place we have additional questions with regard to fuel consumption, accidents, and physical characteristics of road. The first of these items is dealt with properly enough. While it is not especially germane to the work of the Inter-state Commerce Commission as at present laid out, it is interesting information, easily obtained. The questions with regard to accidents, if included at all, should have been made fuller. If this was the place to get the information, it should be got in detail, so as to be of real use. Matters of profile and alignment seem to us to belong more properly to a decimal census than to an annual report.

Long as this form of report is, it will be no great loss to the roads if the various State Commissioners can only be induced to adapt their questions to the lines here laid down. One complicated report is easier to make than several comparatively simple ones, each on a different plan. We trust that the State Commissions will look at the matter in this light.

Washington University, St. Louis, through J. B. Johnson, Professor of Civil Engineering, proposes to build a large machine for testing the strength of wooden beams. It is proposed to test, both green and dry, the following kinds of timber: White pine, long and short leaf yellow pine, cypress and white oak. These will be tested in all sizes up to 24 ft. long, 18 in. deep and 12 in. wide. The machine is of a special design, which allows time tests to be made with constant loads and a variable deflection. This work is undertaken at the request of certain railroad companies and designed for their especial benefit. It is intended that the tests shall be more elaborate and thorough than any heretofore undertaken. They will determine the relative strength of different forms, as well as of different woods. The sum of fifteen hundred dollars has already been raised, but the work cannot be undertaken until at least twenty-five hundred dollars has been subscribed. The condition of the subscription is that one-half shall be due when the machine is erected and the remainder when the tests are completed and reported. It is the intention to complete the tests within a year from their commencement. Three railroad companies have subscribed \$500 each to enable the university to make these tests, and it is hoped and believed that others will join in the subscription when the object and nature of the project is made known to them. The cost to each will be trifling compared with the

*See *Recent Locomotives* (enlarged edition), p. 79.

probable addition to existing knowledge of the properties of timbers. Prof. Johnson states that in the tests will be included any timber sent him by subscribers to the enterprise, and that he will be glad to receive suggestions. Subscriptions will be made payable to Washington University.

A letter in another column gives an interesting account of the West Shore's system of "home route carding" and billing of foreign cars, which was referred to in our report of the Montreal meeting. This is an admirable plan, and the subject deserves attention now because of the fact that the Time Convention will at its next meeting consider the advisability of fixing a penalty for diverting cars from their proper route homeward. That card diversion is a great evil, often working injustice to the car owner, and even making unnecessary expense for the diverting road, there can scarcely be a doubt.

There are not wanting agents and yard masters who willfully send cars wrong, either to get business or to save work; but there are doubtless a great many more cases where the trouble is simply in a lack of system. There appears no reason for counting this a necessary evil, and no doubt a penalty charge of five, three or two dollars, for every case of diversion, would soon eradicate it. This penalty would provide the incentive which in these matters it seems always necessary to make a powerful one.

One of the speakers at the convention thought the present straight mileage system of paying for car service all right provided the roads would properly organize the car service departments. This may be true, but what shall be the incentive to secure this improved organization? The per diem plan brings in self interest, the very best incentive. The Time Convention has, however, instructed its committee to report on the best organization for the car service office, and we shall see what we shall see. But conceding the necessity of the per diem plan in some shape, how sharply shall it be made to stimulate the self interest of roads? Many of the advocates of the straight per diem system at the Montreal convention were inclined to think that 15 cents a day, as provided under the mixed system, insufficient, and that 30 cents would prove a more effectual stimulus for the movement of the cars. It should be kept in mind, however, that the members expressing this opinion were generally connected with roads which have not yet tried any per diem rate, while on the other hand the representatives of the roads which have given the 15-cent rate a trial are almost unanimous in the belief that it is large enough. Mr. D. F. Maroney, of the Baltimore & Ohio, who has from the first taken an active interest in car service reform, and has prepared much valuable statistical information on the per diem question, believes that ten cents per day would be a fairer interest charge, just as productive of increased movement and entirely adequate. There is wisdom in this view, for a low rate, provided it affords the necessary incentive to move the cars, will secure the co-operation of many small roads which would stand out against a higher one. If the investigations now going on shall show that a low rate can be agreed upon it should by all means be adopted, as the vital point is to adopt some system. The rate can easily be changed afterward.

Prof. Manara, a leading Italian legal authority, has recently delivered a course of lectures on Railroad Transportation at the University of Rome. Only the introductory lecture of this course has been published; but this is quite remarkable, and contains points which are worth the notice of American legislators as well as Italian.

The central thought is that railroad law has not yet been sufficiently differentiated from other branches of law. This results in two opposite errors. Sometimes the subject is treated from the purely mercantile standpoint, striving to fix the obligations of the railroads toward the shippers, without reference to the administrative peculiarities of the business or the necessities of the development of the trade of the country. The other extreme (into which countries with state railroad systems are prone to fall) is to treat the railroad purely as an administrative organ and to ignore its responsibilities to the business community. The problem of wise legislation is to avoid both of these extremes, to control the relations of the railroads to the shippers without interfering with the technical necessities of the business, or to give the railroads the necessary guarantee for their secure and vigorous development without rendering the individual shippers helpless before them.

The method of effecting this compromise, of course, varies in different countries. For Italy, Professor Manara urges the development of a special department of railroad law, adapted to the technical peculiarities of the business. In America we have not advanced so far as this. We have sought to attain the same results by making more or less one-sided laws, and entrusting their execution (or suspension) to the hands of a commission. The commission system of railroad regulation is, in fact, the Anglo-Saxon method of effecting the compromise already described.

A young fireman whose sole idea was to shovel on as much coal as possible at every possible opportunity filled the fire-box up solid so badly on one occasion that his train arrived several hours late for want of steam. The engineer had tried remonstrance in vain and concluded that some other method than precept was necessary.

"Mike," said he "take that scoop into the blacksmith shop and tell the boss blacksmith to give her a good bit less lead."

The engineer's face was as calm as a summer sea, and looked as if it might have been a masterpiece of Michael Angelo molded in the best Spanish mahogany.

Mike took the shovel into the blacksmith's shop and re-

peated his order. The boss Vulcan cut off about four inches from the edge of the scoop. Mike carried it back and asked "the engineer how it would suit."

"All right," said the runner, "that was the trouble; she'll steam to-night."

She did. Mike could not get more coal into the fire-box than she would burn, work as hard as he would, and after a few trips he got weak enough to tumble to the fact that a little judgment mixed with the coal was a good thing for a fire, and that, when he knew how, it was easy work to keep an engine hot with a scoop having any amount of "lead," provided he did not work it in the corner all the time.

This parable, which we cut from the *Locomotive Engineer*, contains a great deal of truth, and the lead of many shovels might be reduced with advantage. Only a certain amount of coal can be perfectly burnt in any fire-box, and if the dose is too large, much of the fuel passes off half consumed in the shape of cinders, black smoke and carbonic oxide. The result is that 1 lb. of coal evaporates about 5 lbs. of water, while it is possible, by good firing, to evaporate as much as 10½ lbs. of water per pound of good coal, and from 7 to 8½ lbs. with indifferent coal. The products of perfect combustion are also at a much higher heat, and consequently less heating surface is needed to evaporate the same quantity of water, a fact that is often lost sight of.

Orders have been issued by the General Manager of the Philadelphia & Reading directing all engineers and firemen to report to the superintendents of their respective divisions instead of to the Superintendent of Motive Power. This change will concentrate authority in the hands of the Division Superintendents, and, it is said, conduce to better discipline, as it is said that it is found that most of the breaches of discipline made by engine runners are not neglect of their locomotives or waste of fuel, but disregard of orders as regards the movement of trains. The former class of offences can, of course, be best dealt with by the mechanical head of the road, but the latter come directly under the officers responsible for the conduct of the traffic, and, it is claimed, are best dealt with by him.

Mr. Forney is collecting material for a "History of American Railroads," and owners of old maps, profiles, reports or drawings of old rolling stock, or documents of any sort bearing on the subject, are invited to loan them to him. They will be carefully preserved and returned. Mr. Forney is the highest authority in many departments of railroading, a thorough and accurate investigator, and if the information he already has is supplemented by the drawings and records which exist in many railroad offices, he will do a great public service. It is an unselfish and public-spirited undertaking.

Railroad Location.

BY SAMUEL M'ELROY, C. E.

Our railroad system, aggregating about 150,000 miles of line, and representing capital of over \$8,500,000,000, has grown up under so many conflicting influences and with so little unity of practice that various mistakes occurred, which may have been of little consequence at the commencement, but grow in effect with the rapid growth of the country, and furnish lessons worth the most careful study. Some brief discussion of railroad location, as one of the most vital elements in railroad construction, may possibly be of service.

Different kinds of location are required in practice. A street railroad line is controlled by local population and its movement, generally, within a limited area. A steam railroad location, to connect certain places, within a small district, is also controlled by local questions. As the field expands, and more distant places are to be connected, purely local influences lose, or rather should lose, their weight. When the railroad rises to the dignity of a trunk line, to which local interest should be entirely subordinate, its location should involve careful adherence to primary principles. Unfortunately with us, no such trunk line exists. The distance from Chicago, the centre of the great grain market of the West, to the great shipping port of New York, in an air line, is about 710 miles, and the four great trunk lines in use, the Baltimore & Ohio, New York Central, Erie, and Pennsylvania, are respectively 1,041, 982, 975 and 912 miles. The successive steps of these lines to Lake Michigan are not unlike the journey of the Israelites to Canaan, from Egypt.

There are two general systems of location; one for a comparatively easy district of construction, where local influences control, and one for difficult districts, where alignment and cost of construction control. For different reasons, in both systems, one primary rule should be followed, and that is to obtain an accurate sketch of the intervening country as to controlling features, before any proximate locations are staked out on the ground.

There are some radical objections in practice to anything like final location among valuable farms and improvements, in which usual tangent stations are put in, because random lines requiring expensive field parties, much vexatious trespass on valuable property, and preliminary notice to property owners of the preferred line, which tells formidably on cost of right of way. A cultivated and populous district is usually well mapped, so that without much surveying, the more costly obstacles to construction may be determined, and considerable progress often made in procuring alternate or competitive right of way before final location stakes give all parties notice of the conclusions of the company. In such a country as Long Island I have been, in some cases, offered free right of way across an expensive farm, where it was supposed, from surveys to obtain farm lines, a different line was desired.

This rule applies still more forcibly, though for far different reasons, to location in difficult districts, where directness of line is most affected by topography and cost of construction. Nature is the universal locating engineer, and must be carefully studied to insure the best results. The watercourses define the ravines, slopes and relative levels of a rough country; with these are associated the summits of hills and divides. Country roads often furnish valuable indications of favorable lines and means of examination. Town geological and other surveys often supply essential data. In taking up the location of the future trunk line to Chicago and making a study of the Allegheny range in Western Pennsylvania, even in a district of logging camps and bear dens, I was saved much expensive work by collating such information from various sources, and could determine various main questions of location in advance. A judicious use of the information collated by government engineers in twenty years' fruitless exploration for the Union Pacific Railroad, supplemented by his own examinations, undoubtedly enabled Judah Benjamin to make his rapid and successful location.

With a careful preliminary collation of the important and controlling features of a difficult district in which supplemental work can often be best made with a pocket compass or gonimeter, and an aneroid (or a pair), duly platted, a proximate line can be determined for regular field party work. By using such a line, or any duly selected line, as a base, with cross-section spurs to cover all the points of special difficulty or cost, final location can be determined in the office, with great saving of time and cost, and satisfactory certainty as to its conclusions, and it is in the faculty of collating and obtaining this preliminary information, and using it, that locating genius asserts itself.

The accuracy with which field notes can be plotted and used, even on a comparatively small scale, furnishes the key to the value of this system of office location, and the facility with which a location can be adapted to the more difficult or costly features of a line, on paper, enables an engineer to act and decide, rapidly and surely, curves and tangents, or cuts fills and tunnels.

Various objections to much preliminary chain surveying in rough ground can be obviated. In the higher domain of field work, it is well understood that actual linear measurements are tedious, difficult and costly, and so, as much as possible, their use is avoided by recourse to simpler, easier and more accurate methods. Such a man as Superintendent Hassler, of the Coast Survey, measured but one base line on Fire Island, N. Y., and used it to the next check base on Kent Island, Md., the accumulated error of triangulation being about four inches. When General Serrell, in preliminary Panama railway work, was detailed to explore the Chagre River, he put in a base line, and with two boats and a transit had, in a short time, a river map no chaining could have produced in such a country. By similar methods I was able in 1866 to locate and cross section the Hudson River from Troy to Fort Edward, and the Champlain Canal from Troy to Whitehall, with full notes for ship canal improvement plans, in seven months, with a single field party, and within an appropriation of \$10,000.

For what I have been able to use of this theory, as to field and office work, I am much indebted to such engineers, among others, as Canvass White, John Randall, Wm. C. Young and Major D. B. Douglass, four men who have come short of due recognition in and out of the profession. The care used as to field and office work by these engineers was characteristic; on the other hand their utter disregard for mere details as opposed to main issues was equally characteristic, and both are marks of genius. John Randall carried his office platting of preliminary field work to an extreme nicety. His rulers were used to draw main lines with the scratch of a needle point instead of a pencil, and his angles, platted by natural sines, with large radius. The map of his Postal survey from New York to Albany is a valuable record of close field notes, and in determining the proximate final location of the Ithaca & Owego railroad on a map large enough to cover a ball room floor, he taught such assistants as Edward H. Brodhead the theory of correct work. Major Douglass was extremely careful as to handling and reading instruments, and in taking check notes, and in the coming years, hydraulic engineers will contrast the plans and location of the new Croton aqueduct (if it stands long enough to be filled) with his, in amazement.

A remarkable illustration of difference in locating talent was shown by the Hudson River railroad above and below Poughkeepsie. The southern division, under Mr. Jervis, followed the windings of the river bank; was crooked, noisy, costly and dangerous accordingly; and swamped the estimate for the whole length, before it was half built. Wm. C. Young changed this system at once. He crossed the river bends by bold lines, saving distance, land damage and other cost, and spent money freely on details to save gross amounts. I remember his coming in the office one day, when Israel Smith, and other assistants, had exercised all their ingenuity to save a large and costly house in a village below. The chief looked at their lines, and then drew a tangent through the obstacle, and ordered it in for final location.

With the amazing growth of the country another principle of location becomes annually more imperative, and that is reduction of length, as against a comparatively large outlay for construction, in special cases, and questions of grade below "slipping" grade (or about 60 ft. per mile), and steeper grades, where auxiliary power is readily available for short planes. With an actual minimum cost for maintenance and haul of track and equipment of 35 cents per ton-mile, a business of 1,000,000 ton-miles costs \$1,500 per year, equal, at 5 per cent., to \$30,000 capital. A trunk line of 15,000-

000 tons per year can, therefore, afford to spend \$450,000 to save a mile of line for its freight business alone, leaving out time and cost of passenger movement. With a total movement for 1887 of about 500,000,000 tons, with 53,000,000,000 ton-miles movement, at a minimum cost of not less than \$79,500,000 to the companies for track maintenance and operation, on an average haul of 106 miles, the value of reduction in length presents a most instructive theorem.

TECHNICAL.

Locomotive Building.

The Louisville & Nashville is reported to have placed an order with the Rhode Island Locomotive Works, in Providence, for ten consolidation locomotives.

Car Notes.

The New Brunswick Railway shops at McAdam Junction have just completed two 35-ton passenger locomotives and cars for two complete passenger trains, all of which are provided with the best modern improvements. The work has been designed and superintended by George A. Haggerty, Mechanical Superintendent of the road.

The Burton Stock Car Co. has just completed ten new horse cars 42 ft. in length for carrying 16 horses each. The company is now building 500 cars at its shops at Wichita, 200 at Carlisle, Pa., and 100 at Huntingdon, Pa. Mr. John T. Chamberlain, formerly of the Boston & Albany, has been appointed General Superintendent of the company's car shops, vice Max Brandt resigned. Erskine R. Merrell has been appointed General Superintendent of Transportation, and will have charge of equipment on all lines west of Chicago.

Two Woodruff combined buffet and sleeping cars, Christiana and Raritan, just received by the Central Railroad of New Jersey, are finished in mahogany and highly polished. Large plate-glass mirrors ornament the panels and Wilton carpets cover the floor. Ladies and gentlemen's rooms are at either end, while each berth has an electric bell button to summon the porter if needed. These cars are mounted on steel-tired paper wheels.

The Harlan & Hollingsworth Co., of Wilmington, Del., has shipped three sleeping cars to the Boston & Albany.

The Gilbert Car Mfg. Co., of Troy, N. Y., has just completed several new passenger cars for the Long Island road. The interior metal work is deoxidized.

The Ohio Falls Car Co., of Jeffersonville, Ind., has completed seven passenger cars for the Chattanooga, Rome & Columbus.

The Wason Mfg. Co., of Brightwood, Mass., have completed two parlor cars for the New York, New Haven & Hartford, and will complete eight more in about two weeks. The cars are to be run between Boston and New York, and the White Mountains.

The Birmingham & East Lake has just received three new summer cars from J. G. Brill & Co., Philadelphia. The Birmingham Ensley Dummy Line has placed an order for a number of new summer cars.

Bridge Notes.

Proposals are asked until July 16 for building of four bridges in Kern County, Cal. Address N. R. Packard, Clerk of the Supervisors.

The County Commissioners of Westchester, Pa., will erect an iron bridge over French Creek, near East Nantmeal.

An iron bridge is to be erected at Northville, Mich., by the County Commissioners. Address John B. Harmon.

The Board of Freeholders will build an iron bridge at Trenton, N. J.

Proposals are wanted until July 10 for constructing an iron bridge over the Passaic River at Avondale, N. J. Address Jacob Kierstead, at Franklin.

An iron bridge is to be erected by the towns of Alden and Lancaster, N. J.

The Lehigh Valley is to build a bridge at Wilkesbarre, Pa. A bridge is to be erected at Wever, Lee County, Ia., by the Supervisors of Lee and Des Moines counties.

The Keystone Bridge Co., of Pittsburgh, Pa., has established an office at 55 Broadway, New York, and George B. Mallory has been appointed consulting engineer and sales agent.

Manufacturing and Business.

The Oregon Improvement Co. has purchased of the Waterhouse Electric & Mfg. Co., of Hartford, Conn., an arc and incandescent plant for its machine shops, wharves and railroad station at Seattle, Washington Territory.

The Joliet Steel Co., of Joliet, Ill., has also placed an order for a 45 arc plant with the same company.

The Niles Tool Works, of Hamilton, O., are enlarging their plant by the erection of a building 32 ft. high, 350 ft. long and 36 ft. wide, three power traveling cranes 10 and 20 tons capacity. Additions are also being built to their machine and blacksmith shops.

The following proposals for furnishing a 5,000,000-gallon pumping-engine were opened by the Superintendent of the Aqueduct Board: H. R. Worthington, New York, high-duty, \$23,000; low-duty, \$17,970. National Iron Works, New Brunswick, N. J., three bids, \$18,000, \$22,000, \$22,500. George F. Blake Mfg. Co., New York, four bids, \$17,500, \$20,500, \$23,000, \$23,750. Archibald Young, Toronto, Can., \$33,600. Davidson Steam Pump Co. New York, \$19,600. Holly Mfg. Co., New York, \$23,500. Gordon & Maxwell, New York, \$24,500.

The contract was awarded on June 20 to H. R. Worthington for a low-duty engine at \$17,970.

Among recent sales made by the New York Iron Roofing & Corrugating Co. are: another large order from Mexico, two orders from Maine, one from New Jersey for 60,000 sq. ft., and from New York state an aggregate of 75,000 sq. ft. They also report an increasing demand for their roofing and siding from several other Eastern and Middle states, which has necessitated the running of their works on extra time during the past month.

Charles A. Schieren & Co. report recent sales of their leather link belting to: Smith & Boulemet, New Orleans, La.; P. Lorillard & Co., Jersey City, N. J.; Keystone Electric Light & Power Co., Philadelphia; Smith & Courtney, Richmond, Va.; W. W. Wheeler, Richmond, Va.; Brewster Eros, Addison, N. Y.; Grand Central Mining Co., Fairbank, Ariz.

The John Stephenson Co., Limited, of New York City, is giving special attention to cable tram cars, and has perfected its system of open and close cars, removing from the car body to the car truck the mechanism of the grip, wheel brake and track brake, adding efficiency to the removed parts and providing open and close passenger cars of easy motion.

Iron and Steel.

The general dullness in the iron trades resulted on July 1 in a general shut down of the mills at Pittsburgh and between there and Chicago, or of those departments in which the rate of wages was governed by the scale of the Amalgamated As-

sociation. No agreement has been reached concerning a continuation of the rates which were paid up to June 30, and the men therefore quit work on that evening. About a dozen concerns, including three of the Carnegie mills, have agreed to the terms of the men and resumed.

The rolling mills of the Baltimore & Ohio Railroad Company, at Cumberland, Md., have been closed for an indefinite period. Four hundred men are affected.

Swede Furnace at Swedeland, Pa., has been put in blast under the direction of the superintendent of the blast furnaces of the Philadelphia Iron & Coal Co. The furnace has a capacity of 350 tons per week.

The Cartwright Iron Co., at Allikanna, Ohio, has assigned with liabilities of \$60,000 and assets \$40,000.

The Pennsylvania Steel Co. will soon begin the building of two additional furnaces at Sparrows Point, Md.

The plant of the Carbon Co. is to be turned into steel works, and the erection of two steel melting furnaces has already been commenced.

One of the Simonds rolling machines has been erected in the works of Wm. Sellers & Co., of Philadelphia.

The Laclede Plate & Sheet Mill Co. has determined to discontinue, permanently, the operation of the Laclede Rolling Mills. The mills are expected to close down at once.

Warren, Wood & Co., agents for the Citico, Tennessee and Williamson (Ala.) furnaces, report a rapidly increasing demand for Southern iron. Leading manufacturers in the East and North have tried it with the most satisfactory results.

New Factories in the South.

The *Manufacturers' Record* in its usual semi-annual summary of the increasing industries of the South says that an inspection of the whole field shows the prospects were never before more cheering. And though there is now less excitement, and fewer large iron companies were organized in the first half of this year than in the corresponding periods of 1886 and 1887, there is a more general and diversified development in all lines and all parts of the South.

The number of new enterprises reported by the *Record* for the first six months of 1886 was 812; for 1887, 1,855, and for 1888, 2,023. Comparing the last two half years, iron furnaces have fallen from 80 to 6; mining and quarrying enterprises from 323 to 260; gas works from 24 to 18, and brick works from 116 to 95. On the other hand, the number of machine shops and foundries started has increased from 53 to 72; water-works from 46 to 53; wagon factories from 26 to 36; lumber, machine, and carpenter shops from 361 to 450, and cannery factories from 49 to 170.

The new large blast furnaces of the South, which are expected to add so greatly to the production of pig-iron, are just commencing operations, and with their aid, the *Record* predicts, the manufacturing and mining products of Alabama will furnish fifty times as much freight to the railroads as the entire cotton crop of the state. This may not be an extreme estimate in the light of Mr. Cyrus Eider's showing that the iron ore, coke, limestone, etc., required at the Johnstown Steel Works involved a ton mileage of over 117 million and the delivery of the product 109 million more ton miles, making a total of 226½ million ton miles, or about the average of the ton mileage of either Connecticut, Colorado, Louisiana or Vermont, and nearly ten times the ton mileage afforded by Delaware or Mississippi.

The capital of these new concerns is \$81,508,000; Alabama, 15 millions; Kentucky, 13, and Texas nearly 12. Arkansas, Tennessee and Virginia follow with between five and six millions each. Of course, the capital is greater than the money paid in, but probably not as large as the expenditure and the money which will be required to carry on the various enterprises. None of this development has been made at the expense of agriculture. The staple crops are not declining in quantity, as "the acreage of corn and cotton are both larger than last year, and the condition is generally good, so that there is a possibility that the yield of these staples this season may even surpass the phenomenally large crop of 1887." And in addition to the staple crops, there is a constantly increasing diversification of that more profitable agriculture from which the farmers of the Eastern and Middle States draw the larger part of their incomes. The whole South, according to the *Record*, is thrilled with new life and energy. The farmers are already in fairly good financial condition from the large results of last year, and the combined prosperity of the manufacturing and farming classes must tend to a still more surprising development in that section.

The Hudson River Bridge.

A bill was introduced in the United States Senate July 2 to authorize the construction of this bridge. The bill authorizes James King McLanahan, Jordan L. Mott, Henry Flad, Charles J. Canda, James Andrews, Thomas F. Ryan, Gustav Lindenthal and William F. Shunk to construct a bridge near New York City across the Hudson River. The bridge is to consist of a single span, 140 ft. in the clear above the level of ordinary high water. No pier is to be erected between the principal piers of the bridge. The bridge is to be begun within a year and completed within ten years after the approval of the bill, unless there is unavoidable delay by reason of legal proceedings.

Britton's Metallic Tie.

A metallic railroad tie has been invented by Wm. H. Britton, of Buffalo, N. Y. It is a T-shaped plate of iron or steel, with a tongue about 7 in. running into the earth. This tongue is corrugated, so that the bed may be tamped about it, holding it firm and preventing motion. This tie also serves to keep the rails in gauge. No spikes or bolts are used.

New Rail Drill.

Martin W. Smith, a blacksmith in the employ of the Erie at Susquehanna, Pa., is stated to have sold his patent for a rail drill to Thomas E. Sturgeon, of New York, for \$10,000 cash.

A Novel Casting.

The Pittsburgh Steel Casting Company is to build some heavy castings for the cruiser Maine, now building at the Brooklyn Navy Yard. Among the pieces to be cast is the stern post, an arm of which is 26 ft. 4 in. long, the other 13 ft. 10 in., the shape being nearly that of a right angle. At the widest point it measures 42 in. and the thickness throughout will be 12 in. The estimated weight of the casting is 17 tons. It will, probably, have to be shipped by water around by New Orleans owing to its unwieldy size.

The Ripley Stock Car.

The appliances designed by the Ripley Stock Car Co., of St. Paul, for cheaply and quickly converting a common cattle car into a "palace," are thus described:

These improvements provide separate compartments and feeding and watering facilities, and yet occupy no space inside the car. Consequently, a full load can be carried either of stock, lumber, ties, steel rails or other freight, and the car yield full revenue both ways. It becomes a "palace" car for the convenience of stock shippers, which can in two minutes be converted into a common car for the convenience of the railroad company. Partitions run freely from end to end of car, being hung on small wheels traveling on tracks

at the top of car, and can be placed and fastened at any point in the car, thus furnishing compartments of any desired size, and any desired number of partitions, from one to four. Each partition is fitted with two small gates or wickets, hinged to a centre post, which open to allow stock to pass through without moving the partition. When not in use the partitions may be turned up and fastened under the roof, thus leaving the car entirely clear for transporting merchandise. The supports or tracks on which the partitions are carried are made of gas pipe, and are utilized as conductors for water from the car roof to the watering troughs. The connections with these pipes are so arranged that the troughs can be filled from either end of the car, so that at one stop two cars can be supplied, and the moving of train to water each car is obviated. The hay racks are filled through doors in the sides of car, and slats between which stock feed inside are thrown up and fastened to the side of car when not in use. These improvements are in use on the Chicago & Northwestern system.

Belgian Railroad Economy.

The report of the directors of the Great Central Belgian Railway for 1887 states that favorable results have been obtained by the use of metallic sleepers, the stability of the permanent way being perfect, while the cost of maintenance is sensibly less than that attending lines laid with wooden sleepers. The number of metallic sleepers laid down upon the Great Central Belgian system last year was 6,000. The use of steel rails was commenced in 1869, and the number of steel rails taken up as being no longer serviceable has been inappreciable, except upon the gradient between Lode-linsart and Marcinelle. Since 1869, 66 2/3 per cent. of the iron rails in use have been taken up, while the replacements of steel rails in the same period have been only 0.96 per cent.

The Amount of Vibration in Bridges.

Mr. J. A. Ewing, professor of engineering in University College, Dundee, reports the results of seismographic observations taken on the new Tay Bridge. The seismograph recorded motions during the whole time a train was on the bridge, and was placed on the southernmost of the great girders, where it was expected that the vibration would be greatest. Whenever a train went on the bridge at the Dundee end, a distance of 1½ miles, oscillations were observable, and they gradually increased from 1/16 in. to a maximum of 1/8 in.

Central Pacific Notes.

The Central Pacific has ordered 100 new locomotives within the last few months, and is building some heavy ten-wheel locomotives at the Sacramento shops. The engines have an extended front and straight stack, and weigh 111,500 lbs. in working order. Fifteen hundred 34 ft. freight cars, of 50,000 lbs. capacity, have been added to the equipment lately, 1,000 box and 500 flat cars. The standard rail now used weighs 60 lbs. per yard.

Pile Stop Block.

A stop block or bumper, invented by Mr. John O. Ewan, the Superintendent of the Indianapolis division of the Cleveland, Columbus Cincinnati & Indianapolis, and used on that line, consists of three large oak piles driven 15 ft. into the ground by a pile driver, and placed one behind the other, a short distance apart. It is claimed that this forms a cheap and effective stop.

French Tourist Tickets.

The Paris, Lyons & Mediterranean will, in future, issue circular tour tickets, first, second, and third class, at a reduction of 20 per cent. on ordinary rates, subject to the following conditions: The total distance must not be less than 100 miles, and the traveler must return to the point of departure; the tickets are good for 30, 45, or 60 days, according to length of tour; the time can be doubled by a payment of 10 per cent. on original rate; 66 pounds of baggage free, and the passenger can stop off at any station. Similar tickets enabling the passenger to go by one route and return by another have been for many years issued during the summer and fall by leading English and Continental railroads, but this French line has made a new departure by issuing these tickets all the year around.

Railroad Extension in India.

A new port is promised on the western coast of India, which is very deficient in natural harbors. The railroad just opened to Mormugao crosses the coast range by the Braganza Ghat, 13 miles of a continuous grade of 132 ft. per mile. There are 14 tunnels on it, besides viaducts, deep cuttings, and high banks. Its summit is 1,907 ft. above sea level.

Cape of Good Hope Railroad.

During the year 1887 the Cape government railways returned 4.3 per cent. on the cost of construction after payment of all expenses. It is probable that an extension from Kimberley to the Vaal River at Warrenton will shortly be commenced. The prospects of the extension into the Orange Free State are also favorable.

Trial of an Exhaust Damper.

Mr. Albert H. Griggs, Superintendent of the Locomotive and Car Department of the Providence & Worcester, has been trying an exhaust damper at the base of the stack upon Engine 15, and finds a material economy in its use. His record of two weeks' trial shows miles run per ton of coal with the damper, 63.42; without, 56.94; pounds of coal per mile with damper, 34.68; without, 38.64; pounds of coal per car-mile with damper, 12.79; without, 14.72.

A Colorado Line of 2 ft. Gauge.

The experiment of building a railroad of 2 ft. gauge was undertaken a few years ago in Massachusetts, but the road (the Billerica & Bedford) was not a financial success, and the rails and rolling stock were removed and laid down in Maine, where a line of some length is now in operation. The first road of this miniature gauge in the West has just been opened in Colorado, running some 10 miles from Black Hawk into a mountain mining region. The average grade is about 190 ft. to the mile, reaching in some places as much as 264 ft.; and curves as short as 90 deg. are operated. The largest locomotive, with tender loaded with fuel and water, weighs only 20 tons, and another is half that weight. This little road carries a good deal of ore and is expected also to develop a considerable excursion traffic.

Clearing Locomotive Flues.

The *Locomotive Engineer* gives some useful hints on clearing flues that are blocked by cinders and a hard rubber-like incrustation that is due to the presence of iron in the coal. The reason locomotive flues stop up is that a large cinder or clinker gets stuck in the fire-box end of the flue, and shuts off most of the draft in that flue, and what other dirt gets in stays, as there is not draft enough to pull it out. If the flue is left long enough, it will stop up solid from the other end, and "bake in," and it is a hard job to get it out. In order to get rid of the clinker before the flues get full, the flues should be cleaned every trip over the division. Clean the flues from the fire-box end, and avoid opening the front door and elevating draft pipe. The flue auger cannot be worked

when the tank is full of coal, and consequently should be used when it is nearly empty.

Obtain a pair of flue augers, one long and one short; use the short one every trip to punch out clinkers, and the long one about once a week to probe flues that will get full. When I was firing, I got a length of three-quarter pipe and had a two-foot auger made to screw on one end; on the other end I put a T and two six-inch pieces for a handle; one of these I stopped up at the end, and left the other open. I used it through the fire-box when we were dropping down long hills, and when it got hot I used to pour it full of water through the handle, changing water often enough to keep it cool. The pipe is stiffer than a rod, and you are surer of your aim when the engine is running. A little of this work every trip will prevent the flues being completely stopped up and save time.

THE SCRAP HEAP.

Prize Essay on Thermo-Dynamics, etc.

The following extract from a letter concerning a new refrigerator car has been awarded a brass medal for "The best combination of lucidity of expression with scientific accuracy of statement."

"From the quantity of ice to be placed in the ice chamber the car becomes a first-class winter car, on account of ice being the greatest affinity of cold, it would naturally take up all the cold coming into the car until it reached its limit, when, of course, the contents of the car would come in for their share; but we do not believe, nor do we know of any temperature in this country where the contents of the car would be frozen and thereby damaged."

The statement that the climate of this country will in future be so mild that nothing inside a car can become frozen, will be hailed with general joy, tempered only by the fearful regrets of the representatives of successful steam-heater couplers. Blizzards will, however, kindly accept this notice and stay away, and study the lucid explanation given as to their origin and aim in life, "naturally take up all the cold until it reached its limit, when the contents of the car would come in for their share." How simple, how easy, and alas how true! The blizzard takes up all the cold until man's endurance has reached its limit, and in fact sometimes the limit gets a little beyond the man, and he gets left and is buried accordingly. His last moments would, however, doubtless be consoled by the reflection that "ice is the greatest affinity of cold." Sort of Petrarch and Laura business in fact.

Rulers of the Railroads.

The above is the alliterative but inexact title of an article in which an enterprising Nebraska reporter tells of some of the complaints received by the "Board of Transportation," which is the official name of that state's board, chosen to see that the railroads do not drive their locomotives rough shod, figuratively speaking, over the citizens in their way. Among the complaints lately filed with the board was one from C. M. Clark, of Seward, against the Fremont, Elkhorn & Missouri Valley Railroad. He sets out as the cause of his complaint, that he gets but \$1.25 per day for working on the section. The section foreman, he states, charges \$3.50 per week for board, so that in case the weather is so that one can work all of the time he can make but \$4 per week, which is "no more than the pay of a hotel waiter girl." The work in which he is obliged to engage is the hardest kind of manual labor, while having it carefully and well done in no small degree affects the safety of the lives and property of the public. The complainant therefore asks that the board will order that he be paid at the rate of \$2 per day. Attached to the complaint is an endorsement and request that it be granted, signed by a large number of the citizens of Seward.

Next come Bertha Green and Hattie McDonald with a tale of extortion which has been practiced upon them by the Kansas City & Omaha road. They gave the board to understand and be informed, that on June 5 they took the train at the town of LeRoy for Millington, a distance of one and one-half miles. When the conductor came around he demanded 15 cents from each of them. This they regarded as an excessive charge, and protested against paying it. The conductor promptly announced, without any special attention to the forms of polite society, that "they could either pay that sum or get off the cars." They paid under protest, and ask that the board come to their relief, and cause the amount charged in excess of the legal rate of passenger fare to be refunded. At the rate fixed by law in this state their charge would amount to 4½ cents each. The complaint fails to state whether this sum was tendered the company through its agent, the conductor, or not.

Discreet.

Dr. Paxton, whose church Mr. Jay Gould frequents, said to a reporter who asked him if Jay Gould was a Christian: "Mr. Gould is not a member of any church, and therefore is not an avowed Christian. He is a quiet, retiring gentleman, who would be apt to keep his religious experiences largely to himself in any event." It seems as if Dr. Paxton might be described as a retiring gentleman, whose humor was delightfully dry and used with admirable discretion.—*Life*.

How They Manage It in Ireland.

An extraordinary performance is reported from Ireland. A whole railroad, more than 10 miles long, with a neat station house, a corrugated iron freight house, several iron shelter sheds for cars, all the iron rails, and everything portable has been torn up and carried away piecemeal by the "Irish farmers" between Portumna and Parsonstown. A veracious correspondent writes: "A few days ago I was driving from Portumna to Parsonstown, and when we came to where the station stood, I exclaimed to the driver, 'Hullo! what's become of the station and buildings?' 'Oh, your honor, they're all stolen, and every iron rail from this to Birr—the local name for Parsonstown.' 'And did not the police interfere?' said I. 'Oh, yes; the police took up three or four fellows, but then the magistrate asked where's the prosecutor, and nobody answering, he ordered them to be discharged, and there was great plunder, and some of the rails, I hear, went off by the Shannon on the steamer.' 'What on earth could the farmers do with the rails?' 'Oh, bedad, they make the finest of rafting for lean-to outhouses, and the corrugated iron the best of roofs.' 'And as we went along he pointed out one or two new iron-covered outhouses, which, he said, no doubt came from the railway. I asked a gentleman in the train about it, and he said he believed everybody was afraid to claim ownership lest he might be liable for the debts of the company! Now, sir, this may be a traveller's story, for I know nothing of this railway, except that old Sir Thomas Burke told me that he had lost \$10,000 by it, and that the late Lord Clanricarde had lost \$125,000 by it; but I can vouch that the railway station, etc., and rails are all gone!' Perhaps similar stories will soon come from Iowa.

George H. Corliss and the Robins.

The Boston Transcript is responsible for the following: George H. Corliss not very long before his death built an addition to his well-known engine works. It was necessary to remove a ledge of rock by blasting to prepare the foundation. The men had been put on the payroll, the materials had been purchased and brought to the building and the work of blast-

ing had begun. The next morning Mr. Corliss passed by the place where work was proceeding, when the foreman in charge called him.

"See here, Mr. Corliss," said he, "here's a bird's nest that we've found and that's got to go."

A robin was sitting upon a nest, fast and snug, in a crevice of the rock among some bushes that grew there. The bird flew off her nest as the men came near, and showed five blue eggs that looked as if they had just been laid.

"Can we move that nest somewhere else?" asked Mr. Corliss.

"I'm afraid not, sir. We'd tear it to pieces getting it out, and it isn't at all likely that you could get the bird to go to sitting again anywhere else. We've got to go on, so we may as well rip it out and throw the eggs away."

"No," said Corliss, "we won't disturb her. Let her bring out her brood right there."

"But we'll have to stop the work on the building."

"Let it stop, then."

And so orders were given that operations on the addition should be suspended. They were suspended; and the hands stood still, drawing their pay for doing nothing, or next to nothing, while the robin sat on her nest with her air of great consequence and zealous attention to business, and had her food brought by her mate, and at last hatched her brood. And then there were three weeks more to go by, at the least, before the young ones could fly. Corliss visited the nest frequently, not with any uneasiness or impatience to have the robin and the young ones out of the way, but with a genuine interest in their growth. The old birds had all the time they wanted; and when at last they had slowly helped the clumsy, reluctant youngsters over the edge of the nest, and they showed themselves able to get about on their own hook, orders were given to resume the building operations; and the dull boom of the gunpowder tearing the rocks apart was heard where the birds had peeped.

The Latest Offspring of Venus.

The story of the train crew who side tracked to let the planet Venus go by is given in detail in Caesar's Commentaries, and we have all laughed over the Pennsylvania Dutchman who was running second section of a train, and coming suddenly upon a pair of red lights, came right down to three miles an hour, and followed a canal boat till daylight. The *Locomotive Engineer*, however, gives the following as the last improved edition:

One night we doubled an elbow rather suddenly and a bright headlight shone in our faces, looking as if it was not more than a quarter of a mile away. The old man jumped to his feet and exclaimed: "There! Half a minute more and we'd a got 'em on this curve!" and as he spoke he aimed the starting bar at the caboose and commenced to choke our old hog to help out the air that was getting in its work from the start. At every bump of our engine he would let out an unearthly shriek for brakes, that would freeze the spine of a professional murderer. Said he: "Sliver, my boy, it was a close call; run down there with a red lamp, and tell them to get back to that siding quick; it's that 11 o'clock extra." The writer started out with Aladdin's lamp—and it needed rubbing—and no minister plenipotentiary ever felt more importance with the orders he bore; but just as we got about half way to the headlight, seemingly, it disappeared, looking for all the world just as though it had backed around a curve. From past experience ye scribbler had learned that it was not much use to chase a locomotive—especially if she had any great odds on the start; so there was a halt, and before you could catch your breath a signal was blown recalling the flag. The entire crew was on the engine till we reached the next side track, but there was no train there. Suddenly the bright flash was seen again, and a vote taken declared that they were still backing up and now had several miles the start of us, as they were not dead ahead. Then my bold engineer tried to catch them, but as often as we seemed to get within signaling distance the headlight would disappear, and about the time any of us had declared that they had blown it out it would show up again. Two miles from the terminal station was a new blast furnace, and it had been blown in that day, and the gas check or whatever they called the valve on top, that shows such a white blaze when they are charging the furnace, was what we had been chasing. It was too good to keep, had as the old man wanted to preserve it, and the next trip the engineer got a message from the superintendent to send in accident report of his collision with the steel works.

Russian Railroads.

The mileage and gross receipts of Russian railroads for the past six years were as below. To facilitate comparison with the roads of other countries the versts has been reduced to miles on a basis of 1 verst = 3,501 feet, and the rouble is taken at 75 cents, which is its value in silver.

	Versts.	Miles.	Gross receipts— Millions of roubles.	Millions of dollars.
1882.....	21,530	13,323	212.09	159.07
1883.....	22,215	14,773	228.56	171.42
1884.....	23,039	15,321	226.59	169.44
1885.....	24,041	15,997	230.23	172.68
1886.....	24,508	16,268	222.09	166.57
1887.....	25,276	16,809	249.72	187.29

Of the 62 Russian roads 10 are owned by the government and the rest by private companies. The passenger traffic consisted of 34½ million passengers, and 2½ million soldiers, and there were 10 million puds (180,000 tons) of express goods, and 3,049 million puds (54,882,000 tons) of ordinary freight.

In addition to these roads in Russia, there were 943.6 miles of government road and 20.6 miles of private road in Finland with aggregate gross receipts of \$1,919,637.

Sarcastic.

The new express engines of the Reading road are the heaviest passenger engines running into Philadelphia. They look like locomotives beside the Wootton fire-box mills—"bake-oven attachments," the boys call them. They are too modern for the Reading, and will probably be discarded.—*Locomotive Engineer*.

Erecting a Locomotive in Quick Time.

A remarkable feat in locomotive building has been accomplished in the Pennsylvania shops at Altoona. The various parts of a passenger engine, class A, anthracite, were placed in erecting shop No. 2 one day last week, and in 17 hours the engine was completed. This time includes two hours occupied in testing the boiler. This beats the record of 23 hours made by the Baldwin Locomotive Works of Philadelphia. The work was done under the direction of Foreman A. C. Davis and Master Mechanic John A. Griffith.

The Imperial Russian Post.

Mr. George Kennan in the *Century Magazine* says that this service is now perhaps the most extensive and perfectly organized horse express service in the world. It extends from Kamchatka to the most remote village of Finland and from the shores of the Arctic Ocean to the deserts of Central Asia. One can start from Nizhni Novgorod with an order for horses from the postal department and enter upon a journey to Kamchatka with a certainty that for all that distance, day or night, horses, dogs or reindeer will be ready to carry you to your destination. The mail vehicles do not generally carry passengers, the traveler furnishes his own carriage,

generally a tarantas, a four-wheeled wagon with a pair of hills, to which three horses are usually hitched. He can go as fast or as slow as he pleases, and the established rate of payment for this service in Western Siberia is, including the compensation to the driver, 1½ cents per mile for every horse, or 3½ cents for the usual team of three horses. As a tarantas will carry two persons this brings the fare to 1.68 cents per mile, and the farmers along the routes seem satisfied with this compensation, as they compete with the government.

Mr. Kennan's descriptions of the roads on the steppes will remind engineers of prairie roads and the traveling which they have done on them.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In Ohio the Supreme Court holds that a company which has the possession and control of a railroad in this state, and is managing and operating the same as the lessee thereof, is one "owning the track" of such railroad, within the meaning of a statute, which provides that, "when the tracks of two railroads cross each other, or in any way connect, at a common grade, the crossing shall be made and kept in repair, and watchmen maintained thereat, at the joint expense of the companies owning the tracks."

In Colorado the Supreme Court rules that when, under proper authority, a city grants a railroad a right of way for its track through certain streets, and there is nothing in the ordinance as to the width of the tracks, and no imputation of fraud in procuring the ordinance, the company holding the corporate franchise will not be enjoined, at the suit of the owner of the abutting property, from changing its track from a narrow to a standard gauge.

The constitution of California prohibits the formation of corporations except under general laws, and the statutes as to railroads require a two-thirds vote of the supervisors or common council of the city and county or city to entitle such companies to the use of the streets, etc. The Supreme Court holds that an assignment of a right, granted to certain persons by private act, to maintain a railroad, collect fares, etc., to a corporation, without such grant from the supervisors, conveys to it no right to exercise such franchise.

In Texas the Supreme Court rules that where a railroad company enters on land and constructs its road over it, without acquiring a legal right so to do, the materials used in its construction do not become the property of the land owner, but the company may remove them, and will not be liable as for a conversion.

In 1862 the Toledo & Wabash Railway Company issued \$600,000 of what were termed convertible equipment bonds, payable in 1883, and bearing interest at the rate of seven per cent., payable semi-annually. It operated its road until 1865, when it was consolidated with certain roads in the state of Illinois, the new company being called the Toledo, Wabash & Western Railway Company. It was stipulated in the agreement forming the basis of the consolidation that these equipment bonds should be "protected" by the new company at its maturity. In 1873 the last-named company, continuing to own and operate its road, issued certain bonds amounting to \$5,000,000, and secured the same by a mortgage upon all its property. The road was sold in 1877, under foreclosure proceedings, to one Ellis and two others, associated with him, it being especially provided in the decree that the sale should be made "without prejudice to any claim which may be made by the holders" of the above-named equipment bonds. The Wabash, St. Louis & Pacific Railroad afterwards obtained title to the road through Ellis. The Supreme Court of Ohio now holds that under the statute of that state in force when the consolidation was made and the stipulation in the agreement that these equipment bonds should be protected by the new company, the holders of these bonds acquired the right to require the property of the company that issued them to be applied to their payment; and the consolidation and the agreement being matter of public record, the right is available against all persons deriving title from the consolidated company.

In Wisconsin the Supreme Court decides that the state statute requiring railroads to fence their right of way, and providing that, until such fences are erected, the company "shall be liable for all damages" to persons thereon, occasioned in any manner by the want of such fences, "the company is absolutely liable, regardless of any contributory negligence of the person injured. Nor is the statute unconstitutional because it so excludes contributory negligence."

Carriage of Goods and Injuries to Property.

In Illinois the Supreme Court holds that where a railroad has built an imperfect bridge over a stream of water crossing its right of way, a party suffering damage therefrom has a right to regard the nuisance as of a transient character, and, instead of bringing one action for the whole injury to the value of his property resulting from the original construction of the nuisance, he may sue for the amount of such injury as he suffers from its continuance.

The Supreme Court of California decides that the statute of that state authorizing guardians of infants to convey their ward's lands to railroads if it is necessary for the purposes of the road, and requiring the examination and approval of the probate judge to such conveyance before the same shall become valid, is constitutional; and a guardian's deed, accompanied by the certificate of the probate judge that he has examined the deed and sale, has found the land necessary for the purposes of the railroad, the consideration fair and equivalent, and the sale just and proper; and that he approves and confirms the same, is a sufficient compliance with the statute.

In Texas, in an action against a railroad company to recover damages for injuries to person and property, it appeared that prior to the construction of the company's track, which was built upon a solid embankment about five feet high, water was frequently driven upon plaintiff's land by wind and tide, but that it found an easy outlet across the low-lying ground at the back, and went off without injury to property. At the time the track was being laid, the engineer was told that, if the embankment was made solid, the water could not get out, and damage would result from flooding. The road, however, was built as indicated above, and the water soon after was forced upon the shore, as had frequently happened before, and, being confined by the road-bed of the railroad, it worked the injury complained of. The Supreme Court holds the railroad liable.

In Dakota, in an action against a railroad for damages caused by overflowing plaintiff's land, it appeared that defendant's road-bed, being above the surrounding prairie, intercepted the natural flow of surface water from plaintiff's land, that there were no water courses into which such water could be drained; that plaintiff, for a valuable consideration, conveyed to defendant the right of way across such land; and that the road was constructed in the manner usual in a country topographically like the one through which it passed. The Supreme Court holds the railroad not liable, it appearing that its road was built in the ordinary manner, and with a sufficient number of culverts to allow the escape of the usual flow of surface water, and that the damages in question were caused by an unusually large flow of water.

Injuries to Passengers, Employes and Strangers.

In Alabama a woman had died of pneumonia, alleged to have been caused by injuries received in a railroad accident, a derailment of the car. In a suit against the company, the Supreme Court lays it down that if the injury caused or aggravated the disease so that death resulted, the railroad is liable. The fact that the injuries were not sufficient to have caused the death of a person in ordinary health will not relieve the railroad company from liability, unless it be shown that the death was solely the result of previous bad health.¹¹

In Louisiana the Supreme Court decides that a railway company is responsible for injuries received by one of its passengers at the hands of a porter of a sleeping car, forming part of the railway company's train if it appears that said passenger was not a trespasser on the sleeping car.¹²

In Iowa an infant passenger, 10 years old, became frightened and excited because the train did not stop at the station at which he had to alight in order to reach his home, and, fearing he would be carried beyond his destination, jumped from the train as it passed the station, and was injured. It appeared that the conductor failed to inform plaintiff that the train would pass the station and then back into it, and used no precaution to prevent him from jumping. The Supreme Court holds the company liable in damages.¹³

In Texas the Supreme Court rules that an action cannot be maintained against a railroad company for injuries received by a brakeman while acting in willful disobedience of a rule of the company prohibiting "flying switches." The Court also decides that to authorize a recovery for injuries sustained by a brakeman through the negligence of a conductor, it must be shown that the railroad company had not exercised reasonable care in the selection of its conductor.¹⁴

In the same state, in an action for the death of a fireman in a collision caused by a misplaced switch, it appeared that the brakeman had properly placed the switch, and one train had passed safely by shortly before the collision. Evidence for plaintiff tended to show that this brakeman had proved careless and incompetent on other occasions, but not on the occasion of the collision. Plaintiff did not prove carelessness on the part of any one else, nor that the switch could have been misplaced by the train which passed. The Supreme Court holds the railroad not responsible.¹⁵

In Texas a brakeman was thrown from the tender by an alleged low joint in the track, and it was shown that none of the other employes on the train felt any unusual jolt, nor was any defect found in the track by the track inspectors afterwards. The Supreme Court rules there was no sufficient evidence of negligence by defendants to sustain a judgment for plaintiff, who had assumed the risks incident to such employment.¹⁶

In Alabama the Supreme Court holds that the Alabama statute providing that an employer is not liable to an employee for injuries received by the latter when he knew of the defect or negligence causing the injury, and failed to notify the employer, an employer, knowing of such defect or negligence, cannot set up that the employee, by continuing in the work, has thereby waived his right to sue for injuries received in such employment. This case also decides that the statute of that state providing that when any person is injured by a locomotive or cars of a railroad the burden of proof is on the railroad company to show that the engineer had blown the whistle at certain times and places, stopped the train for obstructions on the track, etc., does not apply to a case where an employee has been injured while engaged in his regular duty of moving cars, and the burden of proving that the company was guilty of negligence is on such employee.¹⁷

In Texas a pedestrian going along a track which was laid in the street of a city, caught his foot in a switch, and being unable to extricate it had it cut off by a locomotive. There was evidence that blocks of wood fastened between the rails at the frogs of switches had been in use upon railroads in the northwest for four or five years, that it prevented the danger of catching the foot in the switch, and that without some similar contrivance switches are not safe. The Supreme Court rules that the absence of these in this case showed negligence, and the railroad is liable.¹⁸

In Texas the deceased while driving in a wagon with a high side-board, and attempting to cross the track at a public crossing, was struck by a passing train and killed. The crossing was grown up with weeds so high as to obstruct the view of the track, and deceased could not have seen an approaching train unless he had risen to his feet in the wagon and looked down upon the track. A south wind was blowing, deadening the sound of the approaching train, and no signals were given of its approach. The Supreme Court holds that the accident was caused by defendant's negligence and it must respond in damages.¹⁹

In Alabama the Supreme Court holds that it is the duty of the employes of a railroad company running a train within the corporate limits of a city or town, where necessity may compel or usage sanction walking upon the track at places other than at public crossings, to keep a vigilant outlook, even for trespassers, and a failure to do so would be negligence for which the company would be liable.²⁰

In Iowa, a person who was struck by a train while driving across a railroad track, testified that no bell was rung on approaching the crossing, and that, if it had been rung, he could have heard it, and his team would not have gone on the crossing. Several other witnesses who were near, and heard the crash of the collision, testified that they did not hear the bell. The engineer and fireman and another trainman testified that the bell was rung. The Supreme Court affirms a verdict in favor of the plaintiff.²¹

Canadian Pacific, semi-annual, 1½ per cent., payable Aug. 17, to stockholders of record July 13.
St. Paul, Minneapolis & Manitoba, quarterly, 1½ per cent., payable Aug. 1, to stockholders of record July 18.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Duluth, South Shore & Atlantic, annual meeting, Marquette, Mich., July 19.

Evansville & Terre Haute, special meeting, Evansville, Ind., July 21.

Marquette, Houghton & Ontonagon, annual meeting, Marquette, Mich., July 19.

North Carolina, annual meeting, Greensboro, N. C., July 12.

Toledo & Ohio Central, special meeting, Toledo, O., July 14.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Ohio Institute of Mining Engineers* will hold its summer meeting at Logan, O., commencing July 11.

The *Railroad Accounting Officers* will meet at the Hotel Brunswick, New York City, July 25, to organize a permanent association.

The *Association of Railway Telegraph Superintendents* will hold its seventh annual meeting at the Murray Hill Hotel in New York City July 11.

The *National Association of General Passenger and Ticket Agents* will hold its fall meeting in Saratoga, N. Y., Sept. 18.

The *National Association of General Baggage Agents* will hold its next meeting in New York City July 18.

The *New England Railroad Club* meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, on the third Thursday of each month.

The *Central Railway Club* meets at the Tift House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *American Society of Civil Engineers* holds meetings on the first and third Wednesday in each month at the House of the Society, 127 East Twenty-third street, N. Y.

The *Boston Society of Civil Engineers* holds its regular monthly meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m. on the third Wednesday of each month.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m., on the first Tuesday of each month.

The *Engineers' Society of Western Pennsylvania* meets in Pittsburgh the third Tuesday of each month.

The *Roadmasters' Association of America* will hold its next convention at Washington, D. C., Sept. 11.

The *New England Roadmasters' Association* will hold its sixth annual convention at Boston, Mass., Aug. 15-16.

The *Western Railway Club* will hold its next meeting on the third Wednesday in September, at the Grand Pacific Hotel in Chicago.

Railroad Surgeons in Convention.

A National Association of Railroad Surgeons was organized in Chicago, June 28, by 250 of them, representing 63 railroads. Every surgeon in the employ of a railroad company was invited to attend by a committee appointed last October at a meeting of the surgeons of the Pennsylvania Railroad.

The meeting was called to order by Dr. C. B. Stemen, of Ft. Wayne, and Dr. J. W. Jackson, of Kansas City, was made temporary chairman. A committee of 50 on permanent organization was appointed. They reported the following officers, who were elected: President, J. W. Jackson, Kansas City (Chief Surgeon of the Wabash); Vice-Presidents, J. H. Murphy, St. Paul (Chief Surgeon of the Northern Pacific); J. B. Murdoch, Pittsburgh, (Pennsylvania); A. W. Rodenour, Massillon, O. (Pennsylvania); B. L. Hovey, Rochester (Buffalo, Rochester & Pittsburgh); and J. B. Luckie, Birmingham, Ala. (Louisville & Nashville); Secretary, C. B. Stemen, Fort Wayne (Pennsylvania & Wabash); Assistant Secretary, J. H. Tresell, Alliance, O. (Pennsylvania); Corresponding Secretary, E. R. Lewis, Kansas City (Wabash Western); Treasurer, J. Harvey Reed, Mansfield, O. (Pennsylvania). At the afternoon session it was decided to have the next annual convention at St. Louis. The time will be fixed by the Executive Committee and the officers. The following papers were read: "A Few Points on Railway Surgery," W. H. Outten, St. Louis; "Fracture of the Pelvis," W. A. Candler, St. Louis; "Brakemen's Injured Fingers," J. A. Jackson, Madison, Wis.; "First Care and Treatment of Railway Injuries," H. H. Middlecamp, Warrenton, Mo.; and a paper by J. B. Luckie, of Birmingham, Ala., upon some cases he had treated.

The *Engineers' Club of Philadelphia*.

A meeting was held June 16. Messrs. Henry Roeske, William W. Thayer, J. H. Skinner, James S. Merritt, Henry G. Morse, John M. Cameron, Reynold T. Hall and W. H. Pratt, were elected members. The Secretary read communications from the Engineers' Club of Kansas City and the Western Society of Engineers on the subject of design and inspection of highway bridges, and a special committee of three was appointed to confer with the societies.

A motion was adopted that the Club join in the invitation extended by other societies to the International Congress of Geologists to hold its next session (which occurs in 1891) in Philadelphia.

The board was authorized to appropriate \$100 for the Kutter fund. Suggestions were made as to the best form in which to continue the publication of the Club Reference Book, and the subject was referred to the directors with power to act.

Mr. E. F. Smith presented a paper upon Dam Building in Navigable Streams, and Prof. J. W. Redway a paper upon the Hydrography of the Mississippi River.

The Secretary presented, for Mr. Rudolph Hering, a Formula for the Mean Velocity of Flow in Sewers, being a simplification, for field and general use, of Kutter's formula. The Club then adjourned to meet Oct. 6.

PERSONAL.

—R. Fenby, Assistant Auditor of the Houston & Texas Central, succeeds Frank Trumbull as Auditor of the Texas & Pacific.

—Mr. E. B. Wall, of the Pittsburgh, Cincinnati & St. Louis, sailed from New York on the 4th inst. for a two months' tour in Europe. The report that he would be accompanied by Mr. F. D. Adams, of the Boston & Albany, is incorrect.

—Abraham R. Van Nest, a prominent merchant of New York City, died June 25. He was a director of the Delaware & Hudson Canal Co., New York, New Haven & Hartford Railroad, Western Union Telegraph and several other institutions.

—F. W. Dunn, Assistant Superintendent of the South & North Alabama Division of the Louisville & Nashville, has resigned to become General Manager of a local road at Birmingham. Before his connection with the Louisville & Nashville, he had been with the Lake Shore & Michigan Southern and previous to this was assistant superintendent of the Union Pacific at Omaha.

—Joel B. Erhardt has been finally discharged as Receiver of the New York City & Northern, and he has also resigned his office as President and Director. He is succeeded as President by H. F. Dimock. E. B. Edwards, who has been Superintendent of the same road, has resigned, and Charles A. Coombs has been appointed General Manager to succeed him. Mr. Coombs is 52 years old, and has been connected with several Eastern roads, and has been General Manager of the Boston, Hoosac Tunnel & Western.

—James C. Anderson, General Passenger Agent of the New York, Ontario & Western, was married at Middletown, N. Y., June 27, to Miss Charlotte Low, the youngest daughter of Henry R. Low, President of the Port Jervis, Monticello & New York. As an expression of the high esteem in which they held Mr. Anderson, the members of his department presented him with several handsome and unique gifts, among which there was a valuable railroad clock, with locomotive movement, a gold headed cane, a pair of bronze ornaments and a pair of smoked-pearl opera glasses, intended for Mrs. Anderson. The general passenger agents presented a solid silver punch bowl.

ELECTIONS AND APPOINTMENTS.

Blackville, Alston & Newberry.—At the annual meeting in Blackville, S. C., the following directors were elected: R. Siegling, D. H. Rally, Simon Brown, M. Brown, H. F. Bremer, A. F. H. Perry, Alfred Aldrich, A. Klein, George A. Wagener. Officers were elected as follows: President, George A. Wagener; Treasurer, M. Brown; Secretary, W. Walker.

Brantford, Waterloo & Lake Erie.—Robert Henry, Brantford, Ont., is treasurer of this company.

Canadian Pacific.—John Higginson has been appointed Master Car-Builder, with office at Montreal, Que.

Chicago & Alton.—T. M. Bates will hereafter perform the duties of Superintendent of the St. Louis & Kansas City division, in addition to his duties as Superintendent of Transportation, until a successor to D. Broeck, resigned, has been appointed.

Chicago, Kansas & Nebraska.—The directors of the Consolidated Company are: C. F. Jilson, H. A. Parker, John Sebastian, Daniel Atwood, H. F. Morris, George W. Samuel, and M. A. Law. The principal office is in Topeka, Kan.

Dayton & Michigan.—The new board of directors has organized with the following officers: Thomas Emery, President; J. J. Emery, Vice-President, and F. H. Short, Secretary.

Denver, Texas & Fort Worth.—R. H. Johnson has been appointed Superintendent of motive power and machinery of this system.

Duluth & Iron Range.—J. L. Greetsinger has been appointed Master Mechanic, with headquarters at Two Harbors, Minn.

Eau Claire, Mississippi & Lake Superior.—The following officers of this new Minnesota company have been elected: R. F. Wilson, President; W. A. Rust, Vice-President; George B. Shaw, Secretary; H. M. Sticking, Treasurer; Charles E. Busell, Chief Engineer; Henry Cousins, Attorney.

Georgetown & Western.—Charles A. Ball has been appointed General Superintendent, with office in Georgetown, S. C.

Lake Shore & Michigan Southern.—C. K. Wilbur has been appointed western Passenger Agent, vice F. I. Whitney, resigned.

Louisville & Nashville.—W. G. Salla has been appointed Assistant Superintendent of the South & North Alabama division, with office in Birmingham, vice F. W. Dunn, resigned.

Louisville Southern.—John P. Newhouse has been appointed master mechanic.

Meriden, Waterbury & Connecticut River.—C. M. Crawford, Chief Engineer, has been appointed Superintendent, with office in Meriden, Conn.

Mobile & Birmingham.—C. L. Petrikin has been appointed Master Mechanic to succeed Mr. Dew, resigned.

Negaunee & Palmer.—The first board of directors of this new Michigan company are: James McMillan, W. C. McMillan, Hugh McMillan, Joseph Taylor and Richard Rice, all of Detroit.

New York & Northern.—H. F. Dimock has been chosen President, to succeed Joel B. Erhardt, resigned. George J. Forrest has been elected Vice-President, and C. A. Coombs, General Manager, with office at High Bridge, N. Y., succeeding E. B. Edwards, resigned.

Nicaragua Canal Construction Co.—The following officers were re-elected at the recent annual meeting in Denver, Col.: President, Francis A. Stout, New York; Vice-President, H. C. Taylor; Secretary, J. W. Miller, New York; Treasurer, H. R. Hotchkiss, New York.

Northern Pacific.—The following changes and appointments are announced: The title of S. G. Fulton, now Assistant General Freight Agent, will be, hereafter, First Assistant General Freight Agent, with office at Portland, Or., as heretofore; J. B. Baird has been appointed Second Assistant General Freight Agent, with office in St. Paul; F. Farrington has been appointed Freight Claim Agent, with office in St. Paul; the freight claim office will be a department of the general freight office.

Northern Pacific.—James Lynch has been appointed Assistant Superintendent of the Rocky Mountain Division, with headquarters at Missoula, Montana.

Ohio & Northwestern.—The Receiver has issued an order stating the office of Chief Engineer is abolished. All communications connected with that office are to be addressed to T. G. Bothwell, Roadmaster, Winchester, O.

Ohio Valley.—James Murphy has been appointed General Freight Agent, with office in Henderson, Ky., vice W. B. Hallsted, resigned.

Paris, Marshall & Sabine Pass.—At the annual meeting this week the stockholders elected for the ensuing year the following directors: D. H. Scott, John Martin, of Paris; Samuel B. Maxey, B. J. Baldwin, Jr., W. D. Heartsill, of Marshall; & J. Fry and Frank Fitzhugh.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Atchison, Topeka & Santa Fe, regular quarterly, 1½ per cent.

Little Schuylkill Navigation, Railroad & Coal, 3½ per cent.

Atchison, Topeka & Santa Fe, regular quarterly, 1½ per cent.

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Little Schuylkill Navigation, Railroad & Coal, 3½ per cent.

Pennsylvania.—E. G. Thompson has been appointed Contracting Agent, with headquarters at New York.

Philadelphia & Reading.—L. B. Paxson has been appointed Acting Superintendent of Motive Power and Rolling Equipment, G. W. Cushing having resigned.

Port Angeles & West Shore.—The first board of directors of this company are as follows: F. S. Lewis, Robert Shields, F. R. Thompson, J. M. Grant and Thomas Maloney.

Pratt, Salt Plains & Rio Grande.—The first board of directors of this Kansas company are as follows: T. E. Simpson, George H. Saunders, W. F. Pitzer, of Pratt; C. H. Douglas, J. D. Karr, of Sun City; J. M. Cannon, H. N. Cunningham, of Nescatunga; J. J. Littlefield, J. M. Graham, of Englewood.

St. Paul, Minneapolis & Manitoba.—F. I. Whitney, formerly of the Lake Shore & Michigan Southern, has been appointed General Passenger and Ticket Agent, vice C. R. Warren, assigned to other duties.

St. Louis, Sturgis & Battle Creek.—The officers of the company are as follows: President, E. C. Nichols, Battle Creek, Mich.; Vice-President, A. C. Waterman, Athens; Secretary, George E. Howes, Battle Creek; Treasurer, Nelson Eldred, Battle Creek.

Southern Pacific.—H. J. Small, late of the Philadelphia & Reading, has been appointed Superintendent of Rolling Stock and Machinery to succeed the late General Master Mechanic Stevens.

Texas & Pacific.—Richard Fenby has been appointed Auditor, vice Frank Trumbull, resigned.

Guy Sumpter has been appointed Treasurer for Receiver, to succeed John S. Wilkes, resigned. The appointment takes effect Aug. 1.

OLD AND NEW ROADS.

Alleghany & Kinzua.—The road has been completed from Bradford to Corydon Summit, Pa., about eight miles, and grading is finished to Ostanders, Pa., five miles beyond. Grading has also been completed for about 3½ miles from Red House, N. Y., and track laying will soon be commenced at that end of the line. The survey is now being made between these points. The road when completed will be 22 miles long. Watson & Shine, Olean, N. Y., are the contractors.

Bangor & Piscataquis.—It is stated that New York parties are endeavoring to secure control of the road by buying the bonds held by the city of Bangor, Me.; and it is also stated that, if successful, they will build an extension south from Bangor to Castine on Penobscot Bay.

Brantford, Waterloo & Lake Erie.—The locating survey has been completed for that part of the road from Waterloo north to Brantford, Ont., a distance of about 18 miles, and the contracts for constructing will be let at once. The road connects at Waterloo with the Canada Southern, which will operate it and furnish the rolling stock. It is intended to continue the line on to Toronto, making the entire length of the road 75 miles. A government subsidy of \$3,200 per mile has been granted, besides which local bonuses have been granted on the line between Waterloo and Brantford, making the grants on that part of the road \$8,500 per mile. J. J. Hawkins, Brantford, is Secretary.

Brookfield.—The contract for constructing this short road has been let to I. J. Griffiths, of Utica, N. Y., at \$10,000 per mile, including tracklaying. The road is to be built from Brookfield to North Brookfield, N. Y., a distance of 672 miles.

Burlington & Missouri River.—The Oxford & Kansas has filed amended articles of incorporation in Nebraska, increasing the capital stock from \$1,700,000 to \$3,000,000. This is the branch extending southwest from Oxford, Kan., to Blakeman, Neb., in the direction of Pueblo, Col.

Camden, Gloucester & Mt. Ephraim.—The Kaighns Point Terminal road has just been completed from Camden, N. J., to Kaighns Point Ferry, and was opened for traffic this week. This line gives the company a new entrance into Camden, and a new temporary depot, lighted with electricity, has been erected. A brick building is to be erected in the fall, to supersede this.

Chesapeake, Ohio & Southwestern.—A survey is now being made for a proposed extension from Paducah, Ky., to Cairo, Ill., a distance of about 30 miles.

Chicago, Kansas & Nebraska.—Articles of consolidation of the Chicago, Kansas & Nebraska and the Chicago, Kansas & Colorado have been filed in Colorado, under the above name. The extension from Norton, Kan., to the eastern line of Colorado is being constructed by the former, and the line between Pueblo and Colorado Springs, Col., to a connection with this road is being built by the latter. The capital stock is placed at \$35,000,000.

Cincinnati, Hocking Valley & Toledo.—The three divisions of this road were sold June 25 at Chillicothe, O., for \$125,000. The Eastern Division was disposed of to David Karshner for \$75,000; the Western Division to W. W. Young, of Georgetown, for \$30,000, and the Central Division to an Eastern syndicate for \$20,000.

Denver & Rio Grande.—It is reported that construction work will soon be commenced on several branches to mining camps, among which will be the extension from Sapinero to Lake City, on which some grading has already been done.

Dodge City, Montezuma & Trinidad.—Tracklaying has been commenced at Dodge City, Kan., and will be completed as rapidly as possible to Montezuma, about 30 miles southwest of Dodge City.

East Bay & Lake Chipola Canal & Railroad Co.—Incorporated in Florida by G. B. Thomson and others, to build a canal from Lake Chipola to East St. Andrew's Bay, and a railroad from thence to the Apalachicola River. The capital stock is \$100,000.

Eau Claire, Mississippi & Lake Superior.—The contract for constructing the first 30 miles of the road from Eau Claire to Independence, Wis., has been let to W. L. Gleason, of Eau Claire, and it is intended to build this part of the road this year. The surveys are now being made.

Fort Worth & Rio Grande.—It is reported that work is to commence immediately on the extension to Brownwood, Tex., from Granbury, 108 miles, which has been surveyed.

Grand Southern.—It is stated that when the reorganization of this New Brunswick company has been completed, an extension will be built from the international boundary at St. Stephen to Hancock, Me.

Guelph Junction.—This Canadian road has now been completed, and will be operated by the Canadian Pacific. It extends from a point on the Canadian Pacific, near Campbellsville, Ont., thence northwest to Guelph, a distance of 15 miles. Guelph is on the main line of the Grand Trunk.

Hartford & Connecticut Western.—It is stated that the formal transfer of the majority of the stock, upon which the Pennsylvania, Poughkeepsie & Boston had an option, has been finally made.

Inter-Colonial.—It is reported that Gray, Clark, Trites & Co., of Salisbury, N. E., have a force of nearly 1,000 men at work on the branch from Pictou, N. S., westerly via River St. John to Mingo Road, about 28 miles, and it is expected to have the grading completed in about two months.

Kentucky Midland.—The city of Frankfort voted for a subscription of \$100,000 to the capital stock of the company to aid in the construction of its road which it is proposed to build from Frankfort, east to Owingville, Ky., and other points.

Knoxville Southern.—About fifteen miles of the road have now been constructed, and an additional 10 miles have been placed under contract. The locating survey for the remainder of the road is now being made. It is to extend from Knoxville, Tenn., to a connection with the Marietta & North Georgia, near the Georgia state line.

Little Rock & Ft. Smith.—It is expected that the extension of the Kansas and Arkansas Valley, lately completed from Van Buren, Ark., to Gibson, Ind. Terr., will be opened for passenger traffic about July 20. The road connects with the Missouri, Kansas & Texas at Gibson.

Los Angeles County.—Tracklaying on the road has been completed from Los Angeles to Santa Monica, Cal., about 18 miles, and it will be opened for business in a few days.

Louisville, Hardinsburg & Southwestern.—An election will soon be held in Hartford, Ohio County, Ky., to vote on the question of issuing \$100,000 to the company, to aid it in building the road.

Louisville & Nashville.—Engineers are said to be surveying a line through the Sequatchie Valley of Tennessee, for a proposed road to connect Bristol, Tenn., and Birmingham.

Maine Shore Line.—Grading is reported to have been commenced near Machias, Me., and 25 miles is expected to be graded before winter.

Manistee & Northeastern.—Twenty-five miles of the road have now been graded northeasterly, from Manistee, Mich., ready for tracklaying, which will probably be commenced this or next week. It is expected to have the road completed from Manistee to Onkama, 16 miles, by July 20. Forty miles of the line is now located north from Manistee to the Betsey River. The road is intended to be built to Traverse City, about 75 miles; and about 45 miles will be completed this year.

Manitoba Central.—Grading has been commenced on the branch from Winnipeg to Portage la Prairie, Man., a distance of 65 miles. G. H. Strevel is the contractor.

Minneapolis & St. Louis.—As an outcome of the recent default in the payment of interest, application was made last week in Minneapolis for a Receiver, and President W. H. Truesdale was appointed. The application was made by H. Seibert, of New York, as trustee for the holders of the \$2,000,000 of improvement and equipment bonds, and alleged that the earnings of their property had been applied to pay the interest on the prior lien bonds. The Central Trust Co., of New York, was trustee for the bondholders, but as it was also trustee for the prior mortgage bonds issued by the company, and as the interests of the holders of these bonds conflicted with the improvement bonds, the company was requested to resign its trusteeship. It refused to do so, and H. Seibert was then elected trustee for the equipment and improvement bonds. It is expected that an arrangement will be made by which the bondholders will accept a lower rate of interest without the necessity of foreclosure.

Missouri, Kansas & Texas.—An agreement is said to have been reached between the Missouri Pacific and representatives of the security holders of this road, by which the Missouri Pacific is to continue to operate the road pending reorganization, and to pay the expenses incidental to operation. Under the lease to the Missouri Pacific six months must elapse after default in payment of interest before the bondholders can demand possession of the property. As long as the Missouri Pacific pays the current indebtedness, other than interest, a receiver cannot be asked for until a second default in interest occurs. By the agreement referred to the security holders avoid the expense of a receiver and the bondholders gain the additional advantage of not having a receiver's tickets placed ahead of their security. No plan of reorganization will be considered by the security holders until the present investigation into the physical and financial condition of the company has been completed.

Negaunee & Palmer.—Articles of incorporation filed in Michigan to build a road from Negaunee, on the Duluth, South Shore & Atlantic, to Palmer in Marquette County, and to iron mines. The distance is about 10 miles. The capital stock is \$100,000.

New Roads.—A survey has been made for a proposed road from Lancaster, Pa., to Safe Harbor, by direction of the Board of Trade of Lancaster, and it is estimated that the road can be built for \$200,000, though no action has yet been taken looking toward actual construction. R. J. Houston, of Lancaster, is Chairman of the Railroad Committee of the Board.

A survey has just been completed for a proposed road from Reading to Lebanon, Pa., connecting at the latter place with the Cornwall & Lebanon, and at the former with the Schuylkill Valley division of the Pennsylvania.

The railroad commissioners have authorized the construction of a short narrow gauge road from Auburn to East Auburn, Maine.

New York & Northern.—The Supreme Court of New York has granted the final discharge of the Receiver and the property has been turned over to the new board of directors, in pursuance of the foreclosure sale.

Orlando & Winterpark.—It is reported that tracklaying will be commenced at once on this Florida road, which was graded last year.

Palmdale.—This road, which extends from Seven Palms, on the Southern Pacific, south to Palmdale, San Diego County, Cal., a distance of six miles, has been completed and opened for traffic.

Pinellas Belt.—Organized in Florida to build a road from St. Petersburg via Pinellas to a connection with the Orange Belt. F. G. Watt and W. B. Miranda are interested.

Pittsburgh & Lake Erie.—Suits for \$75,000 damages, each, have been filed by John C. Henry, late traveling passenger agent of the road, and S. R. Kennedy, formerly of the passenger department, against the railroad company and General Superintendent Holbrook. Henry and Kennedy were discharged early this year, pending investigations of alleged irregularities in the passenger department. The result of the investigations was not made public, but no reinstatements were made.

Pittsburgh, Shenango & Lake Erie.—The company is now prepared to let bids for dredging over 50,000 cubic yards at Conneaut Harbor, O., the projected northern terminus of the road. An extensive system of docks has been commenced, which, when completed, will make it one of the best ports on the south shore of Lake Erie. The channel will be 5,000 ft. long, 200 ft. wide and 20 deep, and nearly straight. When completed, the annual spring freshets will maintain it at this depth without dredging. Wyndham C. Jones, Conneaut, O., is Chief Engineer.

Port Angeles & West Shore.—Articles of incorporation filed in Washington Territory to build a road from Port Angeles, on Puget Sound, south about 125 miles to Astoria, Or.; also from Port Angeles east along the south shore of Puget Sound to Port Townsend. The capital stock is placed at \$5,000,000.

Port Townsend & Columbia River.—Incorporated in Washington Territory, to construct a road from a point on Port Townsend Bay south through Jefferson, Mason, Chehalis, Thurston, Lewis, Cowlitz and Clark counties, to a point on the Columbia River, connecting with the road of the Oregon Railway & Navigation Co. A preliminary survey of the line has been made. The incorporators are interested in the Oregon Railway & Navigation Co. The capital stock is \$3,000,000.

Port Townsend Southern.—It is stated that the survey for the road will be commenced immediately.

Pratt, Salt Plains & Rio Grande.—The company has filed articles of incorporation in Kansas to build a road from Pratt, Kan., to El Paso, Tex., an estimated distance of 600 miles, passing through the counties of Pratt, Barber, Comanche, Clark, Mead and Seward in Kansas. The capital stock is \$6,000,000.

Rogers & Summit.—An extension of 10 miles from Summit to Stillmore, Ga., is being made by the owners of the road, and it is reported that an extension to Reidsville, 20 miles further, is under consideration.

St. Louis, Alton & Springfield.—At a meeting of the stockholders of this company and the St. Louis & Central Illinois, the formal consolidation of the two companies under the above name was effected. Extensions are being built from Alton to Newbome, Ill., and from Bates to Springfield.

St. Paul, Minneapolis & Manitoba.—Tracklaying on the Eastern Minnesota has now been completed from Superior as far as the Nemadji River, about 10 miles.

Seattle, Lake Shore & Eastern.—A short branch from the main line to the new town of Yester, on the shore of Lake Washington, has been completed and opened for traffic.

Southern Pacific.—The second preliminary survey is being made for the proposed branch from the Southern Pacific west, seven miles, to Yreka, which is to be built by an independent company.

Tennessee Coal, Iron & Railroad Co.—The stockholders have voted to authorize an issue of \$1,000,000 capital stock. The company has \$170,000 of common stock in the treasury, and it is proposed to buy from stockholders, pro rata, \$830,000 of stock at 30, making a total then on hand of \$1,000,000. This stock is to be converted into an 8 per cent. cumulative first preference, and sold to the stockholders pro rata at 90. The differential will give the company \$651,000, sufficient to provide for the construction of more coke ovens, opening of additional coal mines, the extension of the railroad and increase in equipment. This will be done without increasing either the stock or the bond obligations of the company.

Tennessee & Coosa.—A force of about 500 hands are at work at Huntsville, Ala., grading the road from that point, which it is expected to complete to Guntersville by October.

Troy & Tiptonville.—The road has now been completed from Rives, west to Troy, Tenn., a distance of five miles. It connects at Rives with the Chesapeake, Ohio & Southwestern, of which it is a branch.

Ulster & Delaware.—Judge Parker, of the Supreme Court, at Rondout, N. Y., has given the town of Harpersfield permission to bring an action to dissolve the charter of the company on the ground that the company has not completed its road to Oneonta, as provided for in the charter of the old Rondout & Oswego company, which was sold under foreclosure. Previous to this motion the town brought an action before the Railroad Commissioners of the state to compel the Ulster & Delaware to build 30 miles of additional road, and was defeated. Application was then made to dissolve the charter of the company.

Washington Short Line.—The Northern Pacific has just secured control of this projected road, which was recently incorporated in Washington Territory to build a road from the Northern Pacific depot in Tacoma, through that city to Point Defiance. It is stated that construction will begin very soon.

Western Maryland.—The locating survey has been completed for the extension of the Baltimore & Harrisburg Division from Ortuana, Pa., southwest to Blue Ridge Summit, Md., at the state line. The distance is about 15 miles.

Wheeling & Lake Erie.—Grading has been commenced on the extension from Bowerstown, O., to Wheeling, W. Va., for which Smith & Ripley, of New York, have been awarded the contract.

Williamsville, Buffalo & Marlborough.—The company has been reorganized, but under the same management as formerly, and the name has been changed to the Buffalo, Williamsville & Northern. It is thought that work will soon commence and be pushed rapidly forward.

Wisconsin Central.—General Manager W. S. Mellen has issued an official notice giving the names of the subsidiary lines which have been consolidated under the name of the Wisconsin Central Company. They are: The Wisconsin & Minnesota, extending from Abbotsford to Chippewa Falls; the Minnesota, St. Croix & Wisconsin, extending from Chippewa Falls, via Lake Phalen Junction and Trout Brook Junction, to St. Paul, Minneapolis & Minnesota Transfer; the Chippewa Falls & Western, extending from Chippewa Falls to Eau Claire; and the Penokee, extending from Mellen to Bessemer, Mich.

The Wisconsin Central Company has assumed the 99-year lease, and will operate the Chicago, Wisconsin & Minnesota, extending from Schleisingerville, via Waukesha and Burlington, to a connection with the Chicago & Great Western, near Chicago.

The Milwaukee & Lake Winnebago, from Schleisingerville to Ashland, with branches, will continue to be operated by the Trustees, but will be worked harmoniously with the Wisconsin Central.

Zanesville & Ohio River.—Tracklaying on the extension to Harmer, opposite Marietta, Ohio, has been completed, and will be soon opened for regular traffic.

TRAFFIC AND EARNINGS.

The Inter-state Commerce Commission.

The Commission has decided the case of the Business Men's Association of the state of Minnesota against the Chicago, St. Paul, Minneapolis & Omaha Railway. The complaint alleged that rates from Duluth, Ashland, Bayfield and other points in that region to interior stations southwest of St. Paul were too high in proportion to the rates from these Lake Superior points to St. Paul proper. The defense of the road is that the St. Paul & Duluth, a competing road, makes low rates between the lake ports and St. Paul and that therefore the defendant is compelled to carry at unreasonably low rates between those points. Commissioner Bragg, in considering this defense, says:

"If the carrier claims to act under a compulsion of circumstances and conditions, which he could obviate by reasonably fair and just exertion on his part in the making of an exceptional rate, then they will not avail him. But if the carrier is in good faith acting under the compulsion of circumstances and conditions, beyond his control, not of his connivance, and which he could not obviate by any reasonable effort on his part, and to avoid overwhelming loss adopts exceptional rates forced on him by the action of an independent state road which is not subject to the act to regulate commerce, and which is operating a shorter and competing line with his own, these are, in our opinion, under the operation of the statute, circumstances and conditions which justify him in doing so."

It is decided that the rates between these competing points are not a fair basis for computing those to stations south and west of St. Paul. Reference is also made to the fact that the interior points referred to have competing railroads to Chicago and other Lake Michigan ports, and that the rates as now adjusted secure these towns a healthy competition between Lake Michigan and Lake Superior ports. To disturb this state of things would injuriously affect business, and could be justified only in case it were necessary for the correction of serious abuses, which in this case are not found to exist. The petition is therefore dismissed.

The Commission has also decided the case of the same Association against the Chicago & Northwestern. This case concerns freight rates from Chicago to local points between Winona, Minn., and Pierre, Dak.; rates from Chicago to Winona and points east of there are governed by competition, but beyond Winona are increased, so that, in effect, the rate per ton per mile from Chicago through is gradually increased as the tariff progresses westward. Commissioner Bragg, in his opinion, refers to the evidence given by the road concerning the cost of operation on the westernmost part of the road. Coal has to be brought from Chicago; the road is more subject to snow blockades than is that portion further east; population is sparse, and station expenses are higher in proportion to the business done. As to the absolute justice of the local rates between St. Peter and Pierre the evidence furnishes insufficient light and no intelligent determination can be given. No evidence is given as to the volume of traffic, except that it is light. How light, is not shown. Comparison has been made with the rates on the rival line of the Chicago, Milwaukee & St. Paul, but no light was thrown upon the subject. It is intimated that this comparison will be taken up at another time. Evidence was also given that rates from Chicago to St. Peter and from St. Peter on westward added together were lower than the through rate. This state of things was not justified, and the Commission will notify the road to explain it. The petition is dismissed on the ground that its claim that the rate per ton per mile between Chicago and St. Peter must be adopted as the standard west of St. Peter is not sustained.

Traffic Notes.

The Minnesota Railroad Commissioners announce a hearing for July 11, at which they will consider the matter of making for the roads of that state a uniform distance tariff on grain, coal, lumber, live stock and dressed meats.

The Chicago & Northwestern will transport, until July 31, free of charge from Winona, all lumber that is to be used in building coal sheds, elevators and warehouses along its tracks in Dakota.

The rate on dressed beef from Kansas City to New York has been reduced by the Wabash to 56½ cents.

Passenger Rates.

The New York, New Haven & Hartford, which for about two years past has made its local tickets almost exactly 2 cents a mile, regardless of odd change, has issued a new tariff which goes back to the old fashion of making all rates multiples of 5, thus doing away with the annoyance of keeping a barrel of "pennies" in each ticket office, and reducing the wear and tear of brain in the mathematical section of the general ticket office. It is supposed that the passengers who enjoy a reduction of two cents will be sufficiently pleased to offset the frowns of those who will now have to pay two cents more.

The New York, Lake Erie & Western has made important reductions in some of its suburban season ticket rates in the vicinity of New York.

The Inter-state Commerce Commission announces a hearing at Elberon, N. J., July 18, in the case of James C. Savery & Co. against the New York Central & Hudson River Railroad, in the matter of emigrant transportation. The case of the New Jersey Fruit Exchange against the Lehigh Valley and Central of New Jersey will be heard at the same place, July 10.

The Transcontinental roads will put in effect on July 5 a new freight tariff, under which the through rates from the Pacific coast to Lincoln, Neb., will be placed on an equality with those to Omaha. The Lincoln merchants are highly pleased, and the newspapers say that the roads are going to refund all amounts collected in excess of Omaha rates during the past year.

California papers state that the recent Transcontinental Association meeting in St. Paul decided to make round-trip passenger rates from prominent California points to the Missouri River and back \$80. Heretofore round-trip tickets at reduced rates have been sold only in the east.

It is reported that the St. Paul, Minneapolis & Sault Ste. Marie is taking flour from Minneapolis to New York at 22½ cents.

A number of prominent Western roads have notified their connections that in the settlement of freight claims they hereafter will not accept a debit for less than 25 cents nor render an account against any connection for less than 25 cents. This rule will not apply to fast freight line accounts.

Export Wheat Rates.

The following statement was adopted by the Chamber of Commerce of Minneapolis, July 2, as embodying its views and wishes:

To the Honorable the Inter-state Commerce Commission:

This Chamber of Commerce, representing the grain dealers in a market which receives and sells more than 50,000,000 bushels of wheat per annum, and more of that than other market in the United States, has learned that various commercial organizations in the Eastern seaboard cities have been demanding of your honorable body to make a ruling

requiring rates of freight on products shipped for export from interior points in the United States to be on the basis of the same charge per ton per mile from the point of shipment to the seaboard as paid upon property consigned to seaboard points. We are convinced that such ruling would greatly injure the interests of the Northwest, dependent as they are very largely upon the cereals, the price of which is determined by the prices of foreign markets less the through rate of freight. We, therefore, petition your honorable body against the imposition of such rate, but on the contrary ask that the present freedom of action be allowed the transportation companies, so that we may be able to dispose of our surplus products in the world's markets to the best advantage.

Iowa Rates.

Judge Brewer, of the United States Circuit Court, on June 25 issued a temporary injunction enjoining the Railroad Commissioners of Iowa from putting in force the new schedule of freight rates recently announced by them. They are required to appear at Leavenworth, Kan., July 5, and show cause why the injunction should not be made permanent. The petitioners are the Chicago & Northwestern, Chicago, Burlington & Quincy, and Chicago, Milwaukee & St. Paul. The petition sets forth that the new law is unconstitutional and in conflict with the Inter-state Commerce law; that it does not sufficiently define the offenses for which it undertook to impose enormous penalties on common carriers; that as each shipment is considered a separate offense the penalties would so accumulate as to cause the confiscation of every railroad in Iowa. It is further averred that the law, in addition to the above penalties, gives shippers the right to recover three times the amount of excess charges on every shipment and the attorney's fees. As the Commissioners' schedule is made prima facie evidence of reasonable rates, an arbitrary presumption of guilt on the part of the railroads is raised without giving them an opportunity to prove their innocence. It is also claimed to interfere with the Inter-state Commerce law because the state rates affect the inter-state rates. The proposed schedule is unreasonable and unjust, and the rates adopted by the railroads May 10 were reasonable and just.

The Railroad Commissioners were also served with an injunction, issued by Judge S. H. Fairall, of the District Court of Johnson County, Iowa. This is on a petition similar to the other. The petitioners are the Chicago, Rock Island & Pacific and the Burlington, Cedar Rapids & Northern.

Cotton.

The cotton movement for the week ending June 29 is reported as follows, in bales:

	1888.	1887.	Increase.	P. c.
Receipts.....	5,387	2,035	3,352	150.0
Shipments.....	19,634	5,385	14,249	280.0
Stock.....	32,654	41,902	10,752	244.0

Seaports:

	1888.	1887.	Increase.	P. c.
Receipts.....	15,026	3,508	11,518	367.0
Shipments.....	34,517	13,675	20,842	154.0
Stock.....	283,898	276,567	7,331	3.0

Coal.

The coal and coke tonnage of the Pennsylvania originating on lines east of Pittsburgh and Erie for the week ending June 23, and the year to that date was as follows:

	Coal.	Coke.	Total.
Total for week ending June 23.....	218,497	62,682	281,179
Total for year 1888 to date.....	5,596,075	1,858,432	7,454,507
Total for year 1887 to date.....	5,024,916	1,618,414	6,643,330

The anthracite coal tonnage of the Belvidere Division of the United Railroads of New Jersey Division for the same periods was as follows:

	1888.	1887.	Dec.
Total for week ending June 23.....	26,383	36,399	10,016
Total for year to June 23.....	735,277	852,466	117,188

The coal tonnages for the week ending June 30 are reported as follows:

	1888.	1887.	Increase.	P. c.
Anthracite.....	292,624	271,362	21,262	7.7
Bituminous.....	283,183	265,838	17,345	6.4

The Cumberland coal trade for the week ending June 30 amounted to 66,552 tons, and for the year to that date 1,717,365 tons.

Railroad Earnings.

The statement of the earnings and expenses of the Norfolk & Western for the month of May and the five months of the year is as follows:

	1888.	1887.	Increase.	P. c.
Month of May:				
Passenger, mail and express.....	\$80,717	\$59,950	\$20,767	35
Freight.....	328,072	261,864	66,208	25
Gross earnings.....	\$408,788	\$321,814	\$86,974	27
Expenses and taxes.....	251,825	204,063	47,762	23
Net earnings.....	\$156,963	\$117,751	\$39,212	33
P. c. of expenses to gross earnings.....	61	63		
Five months—Jan. 1 to May 31:				
Passenger, mail and express.....	\$356,209	\$254,887	\$101,322	40
Freight.....	1,597,003	1,290,696	306,307	24
Gross earnings.....	\$1,953,211	\$1,545,583	\$407,628	26
Expenses and taxes.....	1,185,079	939,170	245,909	26
Net earnings.....	\$768,132	\$606,407	\$161,725	27
P. c. of expenses to gross earnings.....	60	61		

The following is the statement of the Louisville & Nashville for May and the eleven months ending May 31:

	May.	1887-8.	1888-7.	Inc. or Dec.
Gross earnings.....	\$1,326,324	\$1,254,002	I.	\$62,322
Oper. expenses.....	857,940	784,753	I.	73,187
Net earnings.....	\$468,384	\$469,249	D.	\$10,865

July 1 to May 31:

	1888.	1887-8.	1888-7.	Inc. or Dec.
Gross earnings.....	\$14,093,451	\$13,819,756	I.	\$1,173,695
Oper. expenses.....	9,442,440	8,328,067	I.	1,114,373
Net earnings.....	\$5,551,011	\$5,491,689	I.	\$59,322

The statement of the Union Pacific for May and the five months to May 31 is as follows:

	1888.	1887.	Increase.
Month of May:			
Gross earnings.....	\$2,312,191	\$2,188,277	\$123,914
Oper. expenses.....	1,519,934	1,430,452	89,482
Net earnings.....	\$792,257	\$757,825	\$34,432
Jan. 1 to May 31:			
Gross earnings.....	\$21,010,311	\$10,515,064	\$10,495,247
Oper. expenses.....	7,047,143	6,941,180	105,963
Net earnings.....	\$3,963,168	\$3,573,904	\$389,264

The earnings of the New York, Lake Erie & Western for the month of May and for eight months to May 31, are as follows:

Month of May:			
	1888.	1887.	Increase.
Gross earnings.....	\$2,382,879	\$2,264,016	\$118,863
Working expenses.....	1,433,733	1,358,353	75,380
Due leased lines.....	\$949,145	\$905,664	\$43,481
	202,922	165,062	37,860
Net earnings.....	\$746,223	\$740,602	\$5,621
Eight months—Oct. 1 to May 23:			
	1888.	1887.	Inc. or Dec.
Gross earnings.....	\$17,737,470	\$17,133,887	I. \$603,783
Working expenses.....	11,591,784	11,027,012	I. 564,772
	\$6,145,686	\$6,106,675	I. \$39,011
Due leased lines.....	1,555,108	1,485,435	I. 69,673

The net earnings for the month of May during the last five years were as follows: 1884, \$294,573; 1885, \$314,298; 1886, \$626,661; 1887, \$740,602; 1888, \$746,223.

Earnings of railroad lines for various periods are reported as follows:

	1888.	1887.	Inc. or Dec.	P. c.
Month of May:				
Allegheny Valley.....	\$163,311	\$160,323	I.	\$2,988
Balt. & Potomac.....	61,178	64,457	D.	\$3,278
Cam. & Atl. & B. S.....	49,104	52,446	D.	\$3,342
Central of Ga.....	445,505	345,144	I.	100,361
Central of N. J.....	1,003,143	921,783	I.	81,360
C. C. & I.....	411,250	405,892	I.	5,358
Den. & R. G. W.....	103,345	75,356	I.	27,989
Georgia Pacific.....	93,191	83,798	I.	9,393
Leh. & Wilkes. C.....	609,550	713,260	D.	\$103,710
Memphis & Chas.....	120,547	118,447	I.	2,100
N. Y. L. E. & W.....	2,382,879	2,264,017	I.	118,862
N. Y. Ont. & W.....	141,979	127,577	I.	14,402
Norfolk & West.....	408,788	321,814	I.	86,974
Northern Central.....	156,963	117,751	I.	39,212
Northern Pacific.....	528,996	495,670	I.	33,326
Pennsylvania.....	1,537,289	1,049,218	I.	488,071
Phila. & Read.....	1,867,384	1,841,592	I.	25,792
P. & R. C. & I.....	1,755,867	1,666,556	I.	89,311
Total both co's.....	3,633,270	3,174,436	I.	458,834
W. N. Y. & Penn.....	247,542	214,594	I.	32,948
West J. & B. S.....	127,793	114,346	I.	13,447
Total (gross).....	\$17,382,819	\$15,795,040	I.	\$1,587,779
Total (net).....	5,552,098	5,317,904	I.	234,194

Five months—Jan. 1 to May 31:

	1888.	1887.	Inc. or Dec.	P. c.
Allegheny Valley.....	\$798,165	\$779,179	I.	\$18,986
Balt. & Potomac.....	323,114	282,704	I.	40,410
Cam. & Atl. & B. S.....	611,562	578,594	I.	32,968
Central of Ga.....	183,117	182,354	D.	763
Central of N. J.....	184,984	182,145	I.	2,839
C. C. & I.....	429,301	414,005	I.	15,296
Den. & R. G. W.....	2,578,120	2,318,079	I.	260,041
Georgia Pacific.....	840,593	639,854	I.	200,739
Leh. & Wilkes. C.....	4,681,807	4,293,323	I.	388,484
Mem. & Charles.....	1,940,381	1,842,326	I.	98,055
N. Y. L. E. & W.....	2,888,250	2,905,319	D.	17,069
N. Y. Ont. & W.....	604,377	532,384	I.	71,993
Norfolk & West.....	1,953,211	1,545,584	I.	407,627
Northern Central.....	707,572	606,407	I.	101,165
Northern Pacific.....	528,996	495,670	I.	33,326
Pennsylvania.....	1,537,289	1,049,218	I.	488,071
Phila. & Read.....	1,867,384	1,841,592	I.	25,792
P. & R. C. & I.....	1,755,867	1,666,556	I.	89,311
Total both co's.....	3,633,270	3,174,436	I.	458,834
W. N. Y. & Penn.....	247,542	214,594	I.	32,948
West J. & B. S.....	127,793	114,346	I.	13,447
Total (gross).....	\$17,382,819	\$15,795,040	I.	\$1,587,779
Total (net).....	5,552,098	5,317,904	I.	234,194

* Less amount due leased lines.

Early reports of monthly earnings are usually estimated in part, and are subject to correction by later statements.

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